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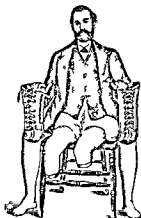
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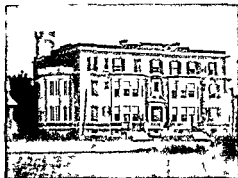
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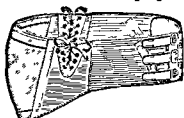
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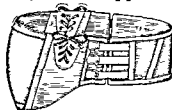
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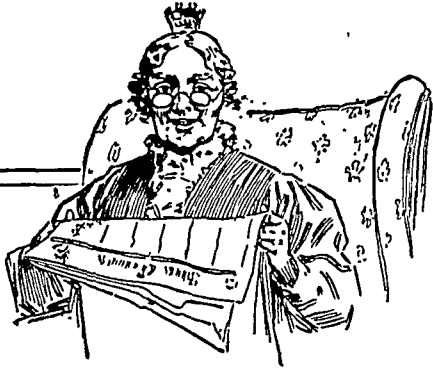
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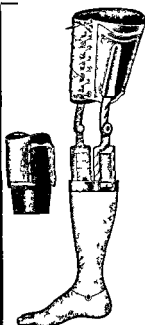
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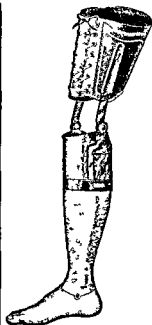
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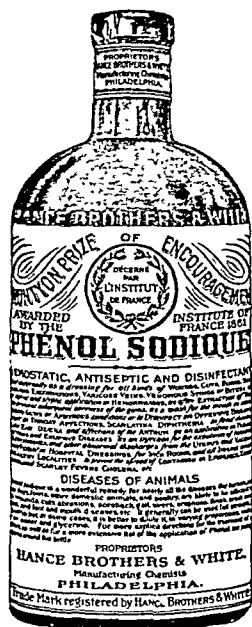
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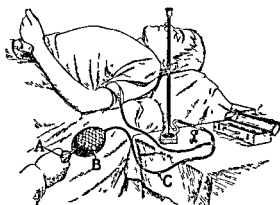
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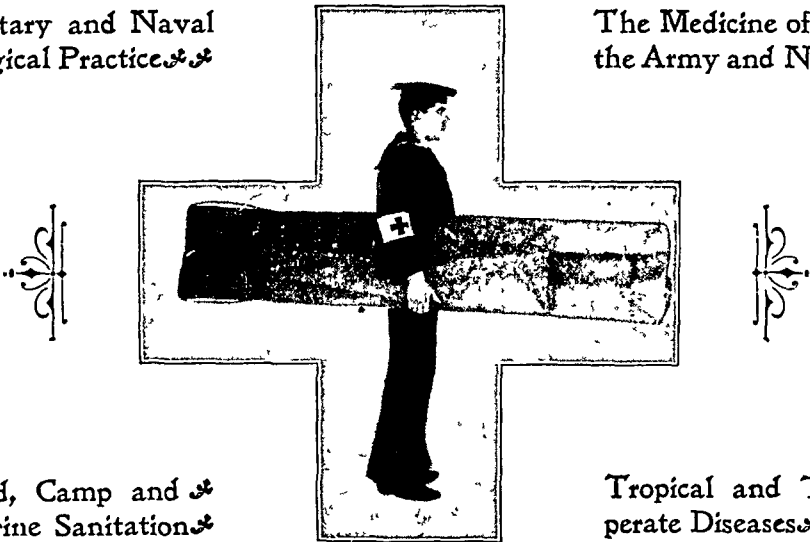
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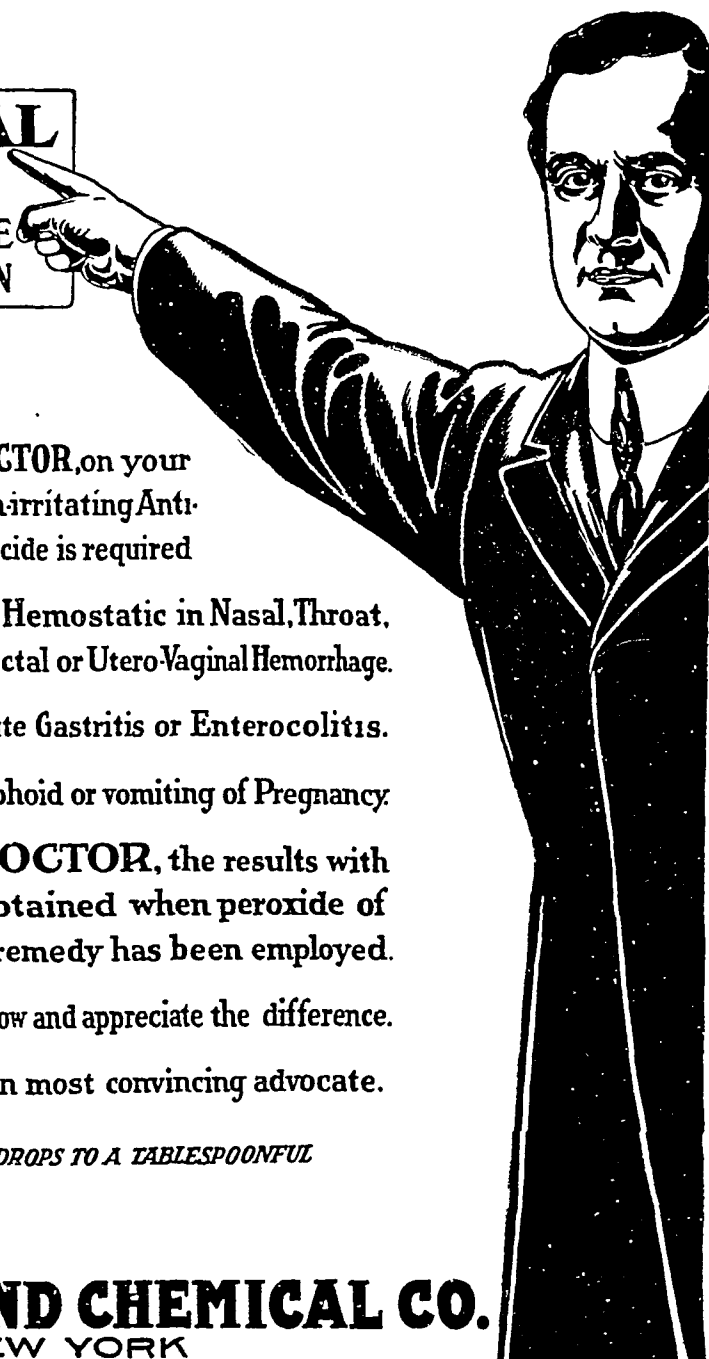
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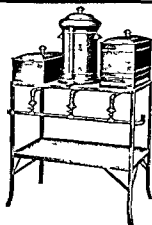
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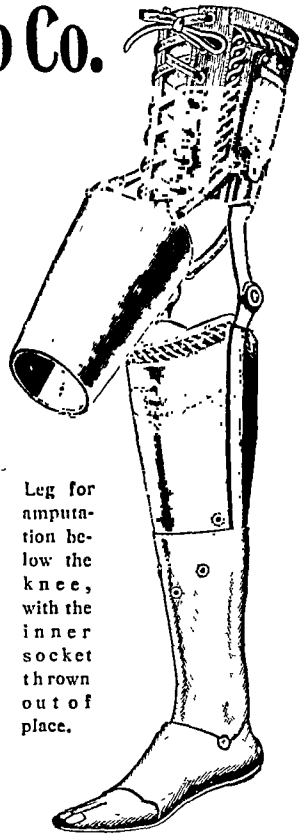
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# ANNALS OF SURGERY

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VOL. XLV

JANUARY, 1907

No 1

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## ORIGINAL MEMOIRS.

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### END-TO-END ARTERIOVENOUS ANGEIORRHAPHY\*

BY HOWARD LILIENTHAL, M.D.,  
OF NEW YORK  
Surgeon to Mt Sinai Hospital

ABOUT a year ago, on learning of the work of Carrel and Guthrie of Chicago, with their remarkable and interesting experiments in angio anastomosis, the idea occurred to me that in a case of impending gangrene of an extremity, due to interference with the arterial blood supply, an arrest of the necrotic process might be possible by diverting the arterial current into the veins. The conditions in which I judged that an experiment of this kind would be justified were the following (1) Threatened gangrene due to embolism, (2) Threatened gangrene due to thrombosed aneurism, (3) Threatened gangrene due to traumatism, with great destruction of arterial tissue, (4) Malignant neoplasm involving important arteries (so that extirpation would threaten the vitality of the part, (5) Angiosclerotic gangrene.

In Mt Sinai Hospital the cases of gangrene due to angiosclerosis far outnumber those due to all the other causes combined, so it seemed to me that my first case

---

\*Read before the New York Surgical Society, November 14 1906

would probably be drawn from this class. To be sure, it is well known that in this disease the walls of the veins as well as those of the arteries are thickened, narrowing or even closing the vascular lumen, but the changes in the venous trunks and their tributaries occur later and are apt to be less marked than those in the arteries. Having once averted the gangrene, it was my hope that by general treatment a return of the trouble might be long deferred, or, possibly, even prevented.

I began looking about for a case suitable for a pioneer operation, always bearing in mind the maxim "non nocere." My prospective patient must have the disease in such a form that manifestly nothing short of a major amputation would save his life and yet the gangrene must not have progressed so far that a re-establishment of the circulation might not save the remainder of the limb. Several patients with angeiosclerotic gangrene presented themselves at the hospital, but before consent could be obtained amputation became necessary. Then, in April, 1906, a young man was admitted who appeared to be a promising subject. During the time of the preliminary treatment, before angio-anastomosis had been decided upon, I was fortunate enough to meet Dr. Carrel, who called upon me at the hospital, and I then had the privilege of hearing an accurate description of the operative technique from his lips. This proved to be of inestimable value.

The patient, W. W., entered one of my wards on April 26, 1906. He was twenty years of age, a native of Russia, and a salesman by occupation. With the exception of a chronic gonorrhœa of six years' duration, his history was unimportant up to the time of his vascular trouble, the symptoms of which began several months before I saw him. There was pain and burning in the calves of the legs, gradually increasing in severity until walking became impossible. Two months before admission a painful ulcer developed on the dorsum of the left great toe, the pain extending to the other toes and finally to the entire leg and thigh up to the groin. Another ulcer now appeared on the heel, with dusky red patches on the front of the ankle.

The physical examination was negative as to eyes, ears, nose, mouth, pharynx, glands, lungs, heart, radial pulses, liver, spleen, abdomen and rectum. Slight mucous chronic urethral discharge. General condition was good in spite of a rather marked anæmia. On the inner side of the terminal phalanx of the left great toe there was an ulcer larger than a thumbnail its outline sharply defined, its edges raised and in part undermined, its floor covered by sloughy granulations discharging thin serous fluid. At the apex of the left heel was a similar ulcer, slightly larger than the one on the toe, its base gangrenous and black. Dusky patches on the point of breaking down were seen on the dorsum of the foot near the ankle. These ulcers and their neighborhood were intensely painful and extremely tender to the slightest touch. The left dorsalis pedis artery could not be felt nor could the left popliteal. Pulsation at the femoral was very faint. The right dorsalis pedis and femoral pulsated normally. The diagnosis of arteriosclerotic gangrene was made and treatment begun with the administration by mouth of glonoin iodide of potassium and with mercury by inunction, in the hope that there might be an underlying syphilitic element even in the absence of its history. On May 16 Dr B. Sachs saw the patient and concurred in the diagnosis.

In spite of treatment the disease continued to progress, the ulcers became larger, the foot dusky and the threatening area on the dorsum exulcerated. A few inflammatory glands could be felt in the left groin. The general condition of the patient greatly deteriorated and he and his family at length realizing that probably nothing short of amputation could be of avail, consented to a preliminary operation on the blood vessels as a forlorn hope. It was my intention to anastomose the upper end of the severed popliteal artery with the lower end of the severed popliteal vein closing by ligation the proximal end of the vein and if necessary, the distal end of the artery.

On June 2, under gas and ether, I made an incision only to find that the popliteal artery was absolutely obliterated and also its continuation upward as far as could be ascertained through a seven inch incision. The operation was abandoned and the wound closed by suture.

Four days later, June 6 the operation was performed upon the vessels in Scarpa's triangle. Carrel advises the employment



of extremely fine milliner's needles and silk. In his experiments upon animals he uses needles as fine as No. 16, the eye of which is almost microscopic in size. The mere threading of these needles is no easy task. The finest needle I was able to procure was No. 12, and with this I used white 000 silk. The needles were sterilized by boiling in the usual way, the silk by heating it in the sterilizer with vaseline. This silk is put into the vaseline *dry*, so that when the proper degree of heat is reached the entire texture of the thread becomes impregnated with the fat. The needles were threaded and ready before the operation began. In this work a needle holder cannot well be used, and a thimble is necessary in operating upon the thick walls of the larger vessels. A supply of thin tape or "bobbin" was sterilized and ready to be used as temporary ligatures which were not to be tied but held in position by small artery forceps or a spring clamp (*serre fine*). No Esmarch's bandage or other general constrictor should be used. Every necessary adjunct to the most perfect asepsis was employed, but no chemical antiseptics were permitted about the wound.

A four-inch incision crossing Poupart's ligament and running approximately in the line of the femoral vessels exposed these structures to view. A few femoral and inguinal lymph nodes, somewhat enlarged because of the infection in the foot, had to be removed. The exposure of the parts was easy and was very perfect. It was then observed that pulsation of the femoral artery existed only in the uppermost portion of that vessel, so that the anastomosis would have to be made with the upper portion of the vein, above the saphenous tributary. The return flow of the circulation in any event could hardly be through the obliterated arteries, which had remained closed even against the systolic pressure of the left ventricle, but it was hoped that blood for tissue nutrition would be carried through the venous capillaries and that it would find its way back through the gluteal, obturator and other veins, as I had observed in cases of thrombosis of the femoral or even of the external iliac vein.

The vessels were laid completely bare for about two inches and femoral pulsation was controlled by a tape ligature clamped around the external iliac artery. A loosely knotted piece of catgut was also placed around this artery to be used in case of the accidental slipping of the tape. The vein was now perma-

nently ligated at the same level as the temporary arterial ligation, and was temporarily ligated below. My object was to allow for the contraction of the severed vessels, so as to avoid tension at the proposed anastomosis. The artery was then severed about a centimeter below the point of intended anastomosis, and the vein about the same distance above it. After section it was found that this precaution had been a wise one, the mouths of the vessels being easily brought together. There was no hemorrhage. Each vessel had been cut across so as to form a stump of about 2 cm. in length, and the lumen of each of these stumps, especially that of the vein, was carefully emptied of residual blood by gentle manipulation of the vessel walls, and was then filled with sterile vaseline as advised by Carrel.

The vascular suture was performed as follows. A stitch was passed and tied, fastening the two mouths together. At a distance of one-third of the circumference from this first suture, another "anchor" suture was passed, and then a third, so that the sutures marked the angles of an equilateral triangle within the circle of the vascular lumen. The ends of the sutures were left long to permit their being used as retractors. Each stitch was passed directly through all the coats of the vessels in such a manner as to avoid the *turning in* of the walls, but rather to evert them ever so slightly to insure the contact of the intimas. By traction upon the anchor sutures, two at a time, the contiguous parts of the vascular walls were rendered straight and parallel. A running suture was passed along each side of the triangle and was tied to the anchor suture as soon as the angles were reached, so as not to break the continuity of the junction. By careful handling of the anchor sutures the vessels (vein and artery) were rotated around the longitudinal axis, bringing within easy reach that side of the triangle which was being sutured. The previous thorough dissection rendered this very easy. Just before the last running suture was tied to its anchor the vessels were emptied of vaseline by gentle manipulation. The final knot being tied, the tape compressing the femoral artery was removed, and at once the pulsating current was established from artery to vein without the suspicion of leakage. Pulsation was marked in the visible part of the femoral vein and could be felt, though intermittently and with some difficulty in the external saphenous. Carrel states that in the larger vessels of

dogs it takes about 20 minutes for the arterial blood to force the venous valves. In this case no pulsation of any of the veins of the foot was noted, but from the ulcers, which at the beginning of the operation were markedly cyanotic and did not bleed, bright red blood began to exude.

Within ten minutes the foot appeared to have recovered somewhat from the intense cyanosis incident to the ligation of the femoral artery, but it never even approached the normal in color. The wound was sutured and dressed dry, the entire limb splinted and slightly flexed at the hip, and carefully covered with a thick elastic layer of non-absorbent cotton. The entire operation consumed about 50 minutes. The patient's condition at its termination was one of shock, though practically no blood had been lost. Pulse 150°, weak and irregular. This shock continued and deepened. By the next morning the pulse was hardly perceptible. Very little urine had been passed—albuminous, with hyalogramanular casts—and altogether the patient's condition was such as to forbid anything excepting general stimulation, which was most energetically carried out.

Eighteen hours after the completion of the operation a distinct line of demarcation had formed, crossing the upper portion of the dorsum of the foot, thence up the sides of the leg and crossing the calf about seven or eight inches above the point of the heel. This entire area was now obviously without circulation: cold, numb and gangrenous. Above this line, however, there was fair circulation and the patient easily located a pinprick. Pulsation could not be felt in the saphenous vein.

The profound shock was not easy of explanation. To be sure, there had been a severe disturbance of his circulatory apparatus, but this would also have been the case had I amputated. Indeed, I had intended to amputate in the event of the failure of the angeiorrhaphy, but this plan had to be abandoned because of the shock. Death occurred 31 hours after the operation, following an ante-mortem rise of temperature to 105°. It is my belief that any radical operation would probably have been followed by a fatal result, and that the death should not be ascribed to the angeiorrhaphy.

A post-mortem examination to ascertain the cause of death was most unfortunately refused, so it was possible only to secure the specimen of vein and artery taking in the anastomosis.

This showed a smooth union with an extremely soft clot in the vein—possibly formed just before death, when the circulation was at its lowest ebb. There was not the slightest hæmorrhage, bulging of the vascular walls or other indication of a giving way under the arterial pressure.

In spite of the failure of this operation we may study its various phases with profit.

In the first place, we must recollect that the condition for which it was undertaken is absolutely hopeless so far as saving the limb is concerned. Amputation either well below the knee or at mid thigh is the usual form of successful treatment, the osteoplastic operation having yielded in my experience the best results. Yet, sloughing of the flaps with re amputation is common enough and the post operative mortality due to the general vascular disease is high.

In the experiments of Carrel, the subjects being healthy animals, a complete reversal of the circulation of the extremity was possible, but in cases of arteriosclerotic gangrene the most that could be hoped for would be the carrying of arterial blood for tissue nourishment through the less diseased vessels, the veins, and back again through other veins—return flow through the diseased and obliterated arteries being obviously out of the question. Actual experiment alone could demonstrate the practicability of this operation, and since in the above case the anastomosis had to be made so high in the main vascular trunks, the matter has not been decided. Had it been possible to work with the popliteal vessels, as originally planned, more light would have been thrown upon this important point.

In threatened gangrene due to embolism of arteries distal to a main trunk, the promise of success seems to me good. For example, in embolism of the popliteal artery, end to-end anastomosis of superficial femoral artery with the saphenous vein might re-establish a circulation in the affected part, averting the necrosis. Practically nothing would be lost in the event of failure. This procedure might also

be tried in cases of thrombosed aneurism of the popliteal artery.

In destruction of a portion of the main artery by traumatism or because of the implication of its walls in an otherwise operable malignant growth, a resection of the artery with interposition of a piece of vein might be practised.

The work in angeiosclerotic gangrene should be continued, but more and more favorable cases should be selected for experiment.

One point demonstrated by this operation is that the danger of immediate traumatic aneurism following the implantation of artery into vein in the human subject, has been overestimated.

NOTE.—The case here reported is probably the first in which artery has been anastomosed with vein without a corresponding counteranastomosis of vein into artery. After my paper had been presented I learned of the case of Dr. Joshua C. Hubbard, of Boston, who had operated for gangrene about one month before my operation, and who had attempted to accomplish complete reversal of the circulation according to Carrel's suggestion, but without employing his methods. Dr. Hubbard was fortunate enough to secure an operative recovery, though without curing the gangrene. The limb had to be amputated. His case was published in the ANNALS OF SURGERY for October, 1906.

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## ROTARY DISLOCATIONS OF THE ATLAS.

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IN this paper there will be brought to notice a dislocation which with the modern improvements of skiagraphy will be found to be of infinitely more frequent occurrence than it has been in the past. Moreover, being by no means necessarily fatal, it was previously overlooked, so that now more and more recoveries will be recognized. There is a minor degree of this dislocation, a subluxation (which will form the matter of another paper\*) which will be found to be still more frequent than the complete displacement.

As anatomists have paid very little attention to the atlanto axial joints, excluding that between the odontoid process and the atlas, it is desirable that a few words be said about them. For practical purposes the joint surfaces may be described as plane and the atlas be said to glide upon the axis. The articular surfaces are not horizontal but are directed downwards and outwards on either side. They are also directed slightly forwards. Thus the atlas rests upon two oppositely inclined planes of the axis. In order to allow for the gliding movements of these joints the ligaments are lax and loose†. In consequence, our heads have to be held firm by muscular effort and not by any other means. If this tonic muscular action is abolished the ligaments allow the head to rotate 30 degrees either side of the middle line. Any violence acting at such a time has what may be termed a "flying start" before it meets any resistance. These joints are peculiar in the whole spine for their adaptation to give a large extent of rotatory

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\*Transactions, Clinical Society of London, 1906

† American Journal of Medical Sciences, 1907

movement; with the result that when any violence is applied obliquely to the head or the spine, these horizontal atlanto-axial joints will suffer the most severely. In spite of this special liability to injury, no surgical study has been made of these joints. In this communication an attempt has been made to remedy this defect and to direct attention to a dislocation which is a great deal more frequent than is thought and is by no means necessarily fatal, so that it

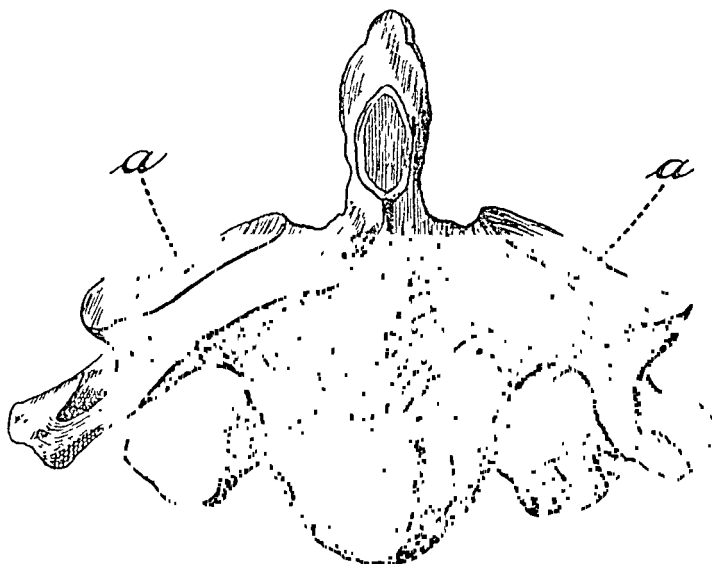


FIG. 1.—Front view of the axis vertebra, to show the outward, downward and forward inclinations of the superior articular facets (*a, a*).

is far more commonly overlooked than discovered. The author reports two new cases.

Twenty examples of rotatory dislocation of the atlas have been collected. Two belong to the author, and have not been fully reported as yet, the other eighteen have been gathered from the literature. No museum in the British Isles has a specimen, except that of St. Thomas' Hospital Medical School, London.\*

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\*The same museum is unique in possessing an example of unilateral rotatory dislocation of the axis on the third cervical vertebra. Specimen 192.

It has been decided to report these in two classes—cases in which the injury was confirmed post mortem, and cases which recovered. The author's cases are reported in their proper classes.

Examples of the first class are subdivided into those with the rotatory dislocation alone and those in which the dislocation was complicated by a fracture. There is only

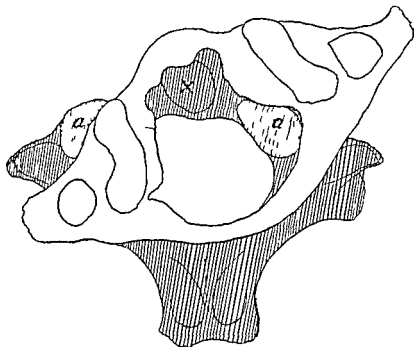


FIG. 2.—Showing anterior displacement of the right side of the atlas (unshaded) on the axis (shaded). The dislocation is only represented as incomplete in the diagram. X indicates the odontoid process and a a the superior articular facets of the axis.

one possible case in the first category, rotatory dislocations being almost always complicated by other injuries. This would suggest that cases of uncomplicated unilateral dislocation recover. In this case, Buisson's, it is not quite clear if there really was a dislocation between the atlas and the axis as well as between the atlas and the occiput. Buisson's case can be doubtfully included in this paper. In this dislocation the vertebral artery of the dislocated



side must run a great risk of being torn. Dupont alone has recorded its rupture.

There is only one possible example of a fatal case of rotatory dislocation of the atlas without other injury, which was recorded by Buisson in 1852. The description is not perfect and it is not clear if the atlas was dislocated from the axis, though such is inferred.

I. ROTATORY DISLOCATION OF THE ATLAS. BUISSON. (*Bulletin de l'Academie de Medicine de Paris*, 1852-53, xviii, 102).—A youth, aged 16, was reaching under a cart which was supported by a stake; disturbing the prop, the cart fell on him. Besides the injury to the neck there was a fracture of the right leg. Death was immediate.

*Post mortem*.—The muscles of the neck were badly bruised, particularly on the right side. The atlas, especially on the right lateral mass, was carried forward, its articular facet being in front of the condyle, which had slipped back; its articular surface was entirely separated from that of the atlas. The ligaments of the condyle which kept it in position, with the articular process of the atlas, were torn from left to right. The occipito-odontoid ligament on the right side was torn off the condyle. The displacement narrowed the spinal canal by half the channel of the foramen magnum.

In eight cases the lesion has been confirmed by an autopsy and was found to be complicated by other injuries; in six the odontoid process of the axis was broken, in one the atlas was broken, in another there was a lateral fracture of the axis as well (Corner's case), and in another the fifth, sixth, and seventh cervical vertebræ were broken. In seven cases the lesion was apparently unilateral, and in one bilateral. As the atlanto-axial joints allow considerable movement without any dislocation, it is often very difficult to decide whether the dislocation is bilateral or unilateral. This difficulty is accentuated by the fact that in some of the unilateral dislocations there is a partial dislocation of the joint of the other side.

Of these fatal cases, in only two did death follow soon after the accident; one in a "few hours" and the other in twenty hours. In the other six, death resulted after periods ranging from twenty-three days to many years,—a very significant fact, as it shows that these injuries need not be

fatal and, when in the living, they are easily overlooked Gibson's case died on the twenty-third day, Cortes' in the eleventh week, Bernstein's on the one hundred and first day, Lambotte's after fourteen months, whilst Broca's and Corner's were found accidentally after death, many years after the injury

The absence and onset of paralytic symptoms is also very noteworthy Neglecting the two rapidly fatal cases, David's and Dupont's, none of the cases presented any paralysis, etc.,—i.e. spinal cord symptoms—at first In Broca's and Corner's cases they never occurred at all Gibson's case died suddenly on the twenty-third day from a sudden increase of the dislocation, due to injudicious movements, without ever having had any paralytic symptoms Cortes' case developed spinal symptoms only at the beginning of the tenth week after the accident, Bernstein's on the seventy-first day Lambotte's after a year

The absence of spinal symptoms in so many cases points to the ease with which the injury may be overlooked The sudden death of Gibson's case shows the penalty that may be paid for overlooking it, whilst Cortes', Bernstein's and Lambotte's cases show that a guarded prognosis should be given for some time after the accident, because of the onset of myelitis

II BILATERAL ROTATORY DISLOCATION OF THE ATLAS WITH FRACTURE OF THE ODONTOID PROCESS —Broca in the *Bulletin de la Société de Chirurgie* (1863 3rd series 549) reports that on autopsy in an old man who died of an urinary disorder the occipital foramen was found nearly obliterated The specimen showed a dislocation of the atlas on the axis with fracture of the odontoid process It was a lateral displacement with a certain degree of rotation During life the man had carried his head a little obliquely and the neck stiffly

III UNILATERAL ROTATORY DISLOCATION OF THE ATLAS WITH FRACTURE OF THE ODONTOID PROCESS BERNSTEIN (*Deutsche Zeitschrift für Chirurgie* lxx 174 *Centralblatt für Chirurgie* No 4 iii) —A man 18 years of age fell from a step of a carriage receiving a blow on the left side of his neck His head had a twist of 40 degrees to the left Up to the seventy first day of his illness he had no spinal symptoms Paralysis then began in the right arm involving successively the right leg left arm left leg bladder rectum and diaphragm Death on the 101st day after the accident

*Post mortem*.—Fracture of the base of the odontoid process with callus formation which led to the compression of the cord. Forward rotatory displacement of the atlas, the right side being displaced forwards on the axis. The left side was in its proper place.

IV. UNILATERAL ROTATORY DISLOCATION OF THE ATLAS, WITH FRACTURE OF THE ATLAS AND AXIS. CORNER. (*St. Thomas' Hospital Museum Catalogue*, 187).—Unfortunately this remarkable case has no clinical history; but, fortunately, the subject of the injury lived and was not paralyzed, as is evidenced by the signs of sound repair about the fracture. As a result, the bones bear marks which have been engraved upon them by the movements of the neck subsequent to the healing of the fracture. These tell their tale, allowing us to ascertain some of the results of the injury. The specimen consists of part of the occipital bone and the atlas, the axis being wanting. Luckily the atlas bears upon it unmistakeable signs of the condition of the axis.

The occipital bone is ankylosed on both sides to the atlas. It is impossible to say whether there has or has not been any fracture of the occipital condyles.

The atlas is much misshapen in consequence of fractures, which have been completely repaired by bone, ankylosis to the occiput accompanying that repair. A fracture has taken place at the apex of the posterior arch and has been united by fibrous tissue, not by bone. In the region of the right lateral mass there has been a further injury. This fracture has apparently been comminuted, accounting for the great deformity of the lateral mass. The damage to the atlas has been confined to the right side, a point which indicates that the head at the moment of the accident was on the right side, so that all the violence was transmitted to the right condyle. The ankylosis of the corresponding occipito-atlantal joint was a direct consequence of the injury; the ankylosis of the joint of the opposite side was secondary and a result of that on the right.

The fractures of the atlas are two in number. The primary one was in all probability the comminuted one of the right lateral mass, owing to the right occipital condyle being impacted on to it. On account of the mechanical disposition of the articular surfaces, the same impact would drive the lateral mass outward and lead to a secondary snapping of the posterior arch, as in the breaking of a bird's "merrythought."

The condition and disposition of the axis can only be inferred by the articular facets on the under surface of the atlas. The left articular facet is markedly smaller than is normal and has been covered with cartilage in the recent state. The facet for the odontoid process presents many peculiarities. Instead of being more or less circular, it is much elongated from above downwards, the process articulating with the left side of the foramen magnum. Its vertical or long axis is oblique and quite out of harmony with the left atlanto-axial facet just described. Therefore, between these two facets there must have been a fracture. Under the large deformed right lateral mass of the atlas, continuous with the facet for the odontoid process just mentioned, is a new facet which must have been a joint between the atlas and the body of the axis. To the right of this



FIG 3 —Photograph of spec men of Case IV



impression there is the place where the right articular facet for the axis should be. This can be traced in outline, but the surface has evidently *not* been covered with cartilage. There must have been a dislocation here as there has been ankylosis of the atlanto-axoid joints. To sum up, the articular surfaces on the under part of the atlas indicate that there had been a lateral fracture of the left side of the axis, involving the outer part of the superior articular facet, and a rotatory dislocation of the rest of this joint and also of that of the other side. That is to say, there has been a lateral fracture with rotatory dislocation of the axis without causing death.

The dislocation of the axis has resulted in the displacement of the right fragment of the atlas backwards and slightly inwards, and the left

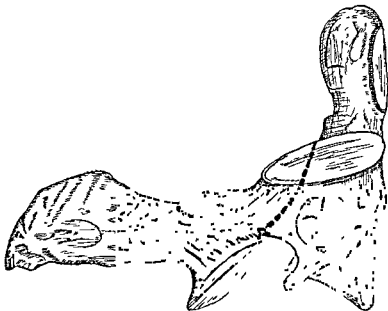


FIG 4.—Side view of an axis vertebra. The dotted line indicates the site of a *lateral fracture*. See American Journal of Medical Sciences 1907.

fragment forwards and outwards. There is also some rotation of the vertebrae on their transverse axis.

A few words must be said as to the possibility of a fracture of the base of the odontoid process having occurred\*. This seems not an unlikely thing when the presence of the unilateral dislocation of the atlas is taken into account. But there are several reasons to make us think otherwise. In the first place the process has worn for itself a well marked facet, which a broken off process would be hardly expected to do. Such might occur if the fragments united with bone. But fibrous union alone is

\*Transactions of the Medical and Chirurgical Society, London, 1907.

known to occur in 97 per cent. when this fracture is required. Also, the articular facet for the odontoid process is continuous with the new facet for the body of the axis, as has been pointed out above, which suggests continuity of bony structure, and therefore no fracture. Apparently, the process has preserved its proper anatomical relationship with the body of the axis, as is shown by the facets. Moreover, the integrity of the process would have a great deal to do with the prevention of instantaneous death, for by locking between the anterior arch of the atlas and the transverse ligament, it will limit the displacement of the axis and prevent damage to the spinal cord and its membranes. In this we may compare Lowson's case\*

A similar question of fracture of the odontoid process was raised

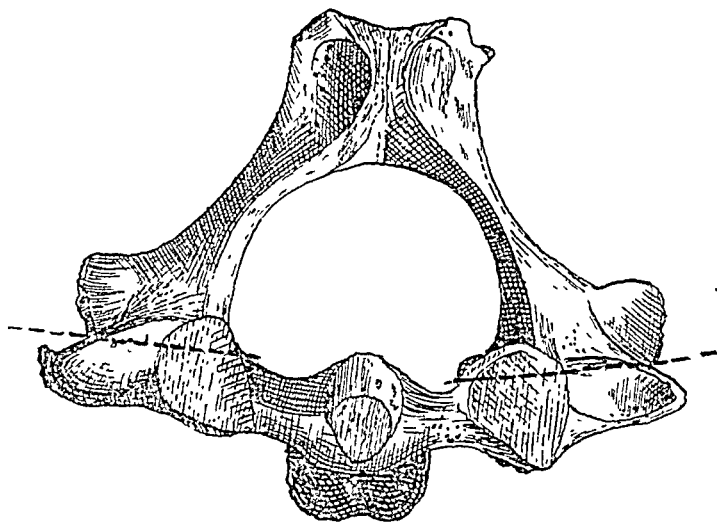


FIG. 5.—View of the atlas vertebra from above. The dotted lines indicate the situations of lateral fractures.

about the author's other case (XIII) and, likewise, it was decided not to be present.

V. UNILATERAL ROTATORY DISLOCATION OF THE ATLAS, WITH FRACTURE OF THE ODONTOID PROCESS. CORTES. (Malgaigne's "Fractures," 11, 329).—A youth, aged 15, was thrown to the ground and received several blows on his head and neck. He was quite well for nine weeks; then he lost the use of his limbs, and died in the eleventh week.

*Post mortem.*—It was found that the atlas was dislocated forwards with the right side more advanced than the left. The odontoid process was fractured across its base and lay almost horizontal.

VI. UNILATERAL ROTATORY DISLOCATION OF THE ATLAS, WITH FRACTURE OF THE 5TH, 6TH, AND 7TH CERVICAL VERTEBRÆ. DAVID. (*Bulletin de la Société Anatomique de Paris*, 1888, lxiii, 910).—A man, aged 26,

\* Medico-Chirurgical Transactions, 1875.

was caught by a buffer in the upper part of the neck and thrown some distance. When seen the neck was very painful. There was a suboccipital depression extending as far down as the spinous process of the axis, a corresponding projection could be felt in the pharynx. There was paralysis of all four limbs. Death 20 hours after the accident.

*Post mortem*—There was dislocation forwards of the atlas upon the axis, to the left side, with compression of the cord. There was also a vertical fracture of the posterior and middle parts of the body of the fifth cervical vertebra. The sixth and the seventh vertebræ were likewise fractured.

VII UNILATERAL ROTATORY DISLOCATION OF THE ATLAS, WITH FRACTURE OF THE ODONTOID PROCESS. DUPONT (*Bulletin de la Société Médicale de la Suisse*, 1876, x, 65)—A man in delirium tremens leapt from the fourth story of a building. Death resulted in a few hours. Upon post mortem examination there was considerable separation between the atlas and the axis. The latter was luxated backwards and pivoted on its left atlanto-axial joint, which remained in its proper place. The odontoid process was fractured at its base, but owing to the fact that the ligaments remained intact there was no displacement of the process. The vertebral artery was also ruptured.

VIII UNILATERAL ROTATORY DISLOCATION OF THE ATLAS, WITH FRACTURE OF THE ODONTOID PROCESS. GIBSON (*Lancet*, 1885 ii 429)—A man, aged 58, rolled down a bank and lay there all night. Upon rising, he was too unsteady to walk and had to be assisted home. His head was very much set forward, the chin resting on the sternum. It was held rigidly in this position. He said that he was suffering from a pain of a burning character. There was a great prominence at the back of the neck just below the occiput. The highest cervical spine was two inches from the occiput. A diagnosis was made of a displacement between the atlas and axis. There was no paralysis. He was laid on the bed and steady traction applied to the head, when the dislocation suddenly reduced with a snap. Crepitus was also felt, indicating the presence of a fracture. The prominence of the spines disappeared and the head went naturally into line with the body. A week later he was seized with abdominal pain after eating some bread and butter. Whereupon, in spite of efforts to prevent him, he started up and almost immediately fell back dead.

*Post mortem*—Considerable separation was found between the atlas and axis. The cord was tightly stretched and pulled against the anterior wall of the canal. There was no damage to the cord. The odontoid process and part of the body of the axis was broken off and remained in its situation against the arch of the atlas, the transverse and other ligaments being intact.

Death after twenty three days.

IX UNILATERAL DISLOCATION OF THE ATLAS, WITH FRACTURE OF THE ODONTOID PROCESS. LAMBOTTE (*Annales et Bulletin de la Société de Médecine d'Anvers*, 189, lvi, 031-133)—The fracture was produced by a simple movement of extension of the head, while the young woman



was sewing. Afterwards, she suffered from pains in the head and a stiff neck. A year later she began to suffer from paralysis in the upper limbs, imperfect anæsthesia, exaggerated reflexes, etc. Death occurred about fourteen months after the injury.

*Post mortem.*—The odontoid process was found to be fractured across its base transversely, and repaired by some fibrous tissue. The atlas was dislocated forwards on the right side only. The transverse and check ligaments were intact.

Having gleaned what knowledge was possible from the records of fatal cases of rotatory dislocation of the atlas, it now remains to apply that knowledge to reported cases of recovery from that injury. Ten of these have been collected,—the earliest being Bayard's, in 1870, and the latest the author's, in 1905. Of these ten, only one presented any spinal symptoms—the second case of Lannelongue; but the description is insufficient to enable it to be said to what extent. In only one is the odontoid process known to have been broken—Bayard's case—which is striking when compared with the fact that that fracture was found in six out of eight cases in which there was a post-mortem examination.\*

In Billot and Picque's case, as in the author's, the patient had considerable difficulty in swallowing. In my case the patient had great difficulty in opening his jaw as well.

In the instance recorded by Uhde, Hagemann and Boettger, the right hypoglossal nerve was permanently paralyzed. It is hardly conceivable that this nerve could have been stretched or ruptured by the dislocated atlas. The probable key to the explanation is to be found in a case of Sir James Paget's which was shown before the Clinical Society.† The hypoglossal nerve was injured in a case of fracture of the posterior fossa of the base of the skull. The violence which produced the dislocation of the atlas in Uhde, Hagemann and Boettger's case would have been prone to fracture the posterior part of the base of the skull. It would appear that this instance is an example with coin-

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\*Transactions of the Medico-Chirurgical Society, 1907.

†Clinical Society's Transactions, iii, p. 183.

cidence of the injuries. The difficulty in swallowing noticed by Billot Picque and the author was probably due to the dislocation causing some injury to the first or second cervical nerves so rendering the pharyngeal plexus inefficient. Sir Thomas Barlow has published a case of hemiatrophy of the tongue with paralysis of the soft palate following injury to the upper cervical spine and (?) to the rim of the foramen magnum in the Transactions of the Clinical Society of London 1889 xxii pp 322-327. He regards the symptoms to have arisen in consequence of cicatrization in the healing of the fracture in the occipital bone. The cases of Sir James Paget and Sir Thomas Barlow, in all probability offer the correct explanation of the paralysis of the right hypoglossal nerve observed by Uhde, Hagemann and Boettger in the case which they have recorded (XIX).

**X UNILATERAL ROTATORY DISLOCATION OF THE ATLAS** BACON (*University Medical Magazine* 1891 iii 182)—A man aged 22 fell down sixteen steps striking his head. He was conscious and able to walk. His head was slightly flexed and turned to the right. It could not be moved.

On examination the spinous process of the axis was turned to the left and upwards for a quarter of an inch. In the pharynx corresponding to the body of the axis was found a marked projection. There was no paralysis or anæsthesia.

The man got quite well and the movements of his head returned to a limited extent.

**XI FRACTURE OF THE ODONTOID PROCESS AND ROTATORY DISLOCATION OF THE ATLAS** BAYARD (*Boston Medical and Surgical Journal* 1870 N S v xliii)—A girl aged 6 fell a month previously from a pile of boards about five feet high striking her head and neck. Afterwards she could not move her head without pain. She was treated for neuralgic pains in the neck.

The head was inclined forward and to the right she supported it with her hand under her chin. Any attempt to rotate or move it caused great pain. No irregularity could be found in the vertebræ of the neck. She was ordered to be kept on her back as much as possible. Nine months later she walked well but still supported her head. The head now rested on the right shoulder and the neck was much altered in shape the irregularity giving the impression that there was a partial luxation of the atlas and axis. She wore an apparatus to support her head for a year at the end of which she could hold her head up and even rotate it consider

ably. Three years after the accident she had an abscess in the neck from which was discharged the separated odontoid process.

XII. UNILATERAL ROTATORY DISLOCATION OF THE ATLAS. BILLOT and PICQUE. (*Bull. et Mem. de la Soc. de Chir. de Paris*, 1900, xxvi, 23).—A man, aged 21, fell upon his head a distance of three and one-half metres, without losing consciousness, got up and walked a hundred metres. He complained of violent pain at the nape of his neck, great difficulty in swallowing and on movement of his head. There was no paralysis or anæsthesia. The pain in the neck disappeared in about fifteen days; the dysphagia lasting a little longer. At the end of three weeks he was sent back to his regiment with only a stiff neck. The face was turned a little to the right. The upper part of the neck was deformed; a little out of the median line a prominence was visible. The spinous process of the axis was deviated a fingerbreadth to the right. The movements of flexion and extension were very limited and rotation was very incomplete. There was a protuberance in the right side of the pharynx. The case was called one of dislocation to the right of the atlas by rotation of the vertebra upon its body, without fracture of the odontoid process.

Recovery without any serious effects.

XIII. UNILATERAL ROTARY DISLOCATION OF THE ATLAS ON THE AXIS, WITH FRACTURE OF THE ANTERIOR ARCH OF THE ATLAS. NO PARALYTIC SYMPTOMS. RECOVERY. (CORNER.) (*Clinical Society's Transactions*, London, 1905.) Shown at the Clinical Society of London, February 24, 1905.—J. L., aged 21, fell from off a horse, striking his forehead. Beyond making him "see stars," he was not much hurt. He got up and rode his horse home. He came to St. Thomas' Hospital complaining of a stiff and somewhat painful neck, and was treated with liniment and rubbing; but as he was no better at the end of a fortnight he was admitted.

Examination.—The patient carries his head a little flexed and turned to the right. Movements are limited and the neck is stiff. The left transverse process of the atlas is easily palpable between the mastoid process and the angle of the jaw. On the right side it cannot be felt, the examining finger sinking into a groove. Further palpation gives the impression that the transverse process is displaced backwards. There must be a dislocation of the right atlanto-axial joint. On the right side of the neck, below the point just mentioned, there is felt a prominence of the middle of cervical vertebræ, which shows that there has been some accompanying rotation of the vertebræ below the dislocation. After a few minutes' standing the man became fatigued.



FIG 6—Photograph of J. L. showing his head turned towards his right shoulder



An examination on a later day confirmed the above observations and it was further remarked that he could rotate his head to the right or injured side, but not to the left or uninjured side. A further observation was that he had difficulty in opening his mouth and his articulation was indistinct. There was no difficulty in swallowing such food as the restricted movements of his jaws allow him to take. He was never able during his stay in hospital to open his mouth sufficiently to allow his pharynx to be examined by a finger. There were never any paralytic or anæsthetic symptoms.

When his pharynx was examined, after his jaws had recovered sufficiently to enable him to open his mouth, the right side of the atlas, which was displaced forward, could be felt as a prominence on the posterior wall.

The skiagraph shows the unilateral dislocation of the atlas from the fracture of the anterior arch of the atlas. It is not clear whether the odontoid process is broken, but it was generally thought at the meeting (Clinical Society\*) to be intact.

**XIV UNILATERAL ROTATORY DISLOCATION OF THE ATLAS** HESSE, (*Beitrage zur klin. Chir.*, 1895, XII, 93) —A man fell from a cherry tree striking on his head. His head was turned to one side and his neck was stiff and immovable. He was never fully unconscious and had a peculiar sensation about his arms and legs. There was no paralysis. The head was replaced when under an anæsthetic. Professor Socin diagnosed a 'torsion luxation of the atlas.' The recovery presented nothing noteworthy.

Described as an example of the rotation luxation of Uhde Hagemann and Boettger.

**XV TWO CASES OF UNILATERAL ROTATORY DISLOCATION OF THE ATLAS** LANNELONGUE (*Compt. Rend. de l'Academie de Science*, Paris, 1904 CXXXIX 495-6) **CASE I** —A child, 8 to 9 years of age hung himself accidentally whilst playing. There was an unilateral dislocation of the atlas on the axis which was reduced and the child made an uninterrupted recovery.

**XVI CASE II** —An officer was thrown from his horse and suffered from a similar dislocation of the atlas on the axis. He had four limbed paralysis. Reduction was followed by recovery, though it is not stated whether the paralysis passed off completely.

**XVII UNILATERAL ROTATORY DISLOCATION OF THE ATLAS** LEGG (*Lancet* 1893, II, 1382) —A lad (schoolboy) tumbled over another boy in the playground and turning over caught the back of his head in an angle formed by the trunk of a tree and the ground.

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\* Clinical Society's Transactions (London), xxxviii p 228, also in the next volume.

The head remained twisted to the left and he was quite incapable of rotation, all attempts at it causing great pain. The chin was somewhat raised so that he could not see his toes. Pressure over the lower cervical spinous processes caused no pain and disclosed no irregularity, but when applied to transverse process of the atlas, especially on the right side, it caused great pain. The diagnosis was "a probable rotatory dislocation or hyper-rotation of the atlas upon the axis." The dislocation was reduced by exerting traction on the head with counter-extension on the trunk, a click being heard at the moment of reposition. Recovery uneventful.

XVIII. UNILATERAL ROTATORY DISLOCATION OF THE ATLAS. PANAS. (*L'Anjou Médical*, 1898, 41).—A case of luxation of the atlas and axis was described with special reference to the symptoms of amblyopia. The man fell whilst carrying things. There was right torticollis. Not much space is given to the dislocation itself. The sight of the right eye was lost some days after the accident. There is a long account of the possible pathology of the ophthalmic symptoms. Recovery from the injury. There never were any paralytic signs.

Mr. J. B. Lawford, Ophthalmic Surgeon to St. Thomas' Hospital, to whom I showed this paper, thought Panas' explanation insufficient. M. Panas is the only observer to mention eye symptoms in these cases.

XIX. ROTATORY DISLOCATION OF THE ATLAS. UHDE, HAGEMANN AND BOETTGER. (*Archiv für klinische, Chirurgie*, 1878. xxii, 217).—A man, aged 34, fell thirty feet. He sustained a comminuted fracture of the right humerus. There was also pain and tenderness with immobility of the neck. The head was carried bent over to the right, the chin being directed to the left. Moreover, the head was flexed, thus being twisted on all three axes. On the right side the transverse process of the atlas could not be felt in its proper position and the finger sunk deeply into the neck in this place. It was ascertained that the right transverse process was displaced forwards. The corresponding process on the left side is asserted to be displaced backwards, but it is not made clear upon what authority the statement is made. There was a permanent paralysis of the right hypoglossal nerve. There were no spinal symptoms. The deformity was restored by extension and the man recovered. The case is called one of *luxatio atlantis violenta*, with dislocation of the atlanto-axial joints.

It now remains to draw in brief form the features by means of which rotatory dislocations of the atlas may be observed clinically, so that the lesion may be recognized as an important and not infrequent injury amongst instances of sprained necks.

To begin with, there is the history of the accident, in which the violence is commonly applied to the front and top of the head. There are no symptoms of paralysis or anæsthesia, neither has there been recorded a case of spinal concussion\*. The neck is painful to touch and to move. It is stiff and capable of little movement. The position of the head is very characteristic. It is flexed and turned a little to one side, usually the right. In more severe examples the head is bent towards one shoulder so that the chin points to the other side. In the latter case, it is probable that the head cannot be moved. In the former and less severe varieties, the head can be rotated more to the side to which it is directed than to the other.

The side to which the chin is directed is that on which the transverse process of the atlas is rotated backwards. The side to which the head cannot be rotated is that which is, or is only partially, dislocated. For the joint of the side to which the head is rotated is fixed, forming the centre of the curve along which the other joint moves. For example, in turning the head to the right, the right atlanto-axial joint is fixed and the left moves, and vice versa. If the left side is dislocated, the head can only rotate a little to the right as the left joint does not exist. It can be rotated a little to the left, since the right joint can move, but only a little, as the forwardly dislocated left joint is the fixed point and will not permit more. By means of the rotatory movements present it is possible to decide whether the injury is unilateral or bilateral but care must be taken in making observations.

Normally, the transverse process of the atlas can be felt half way between the tip of the mastoid process and the angle of the jaw. This can be felt plainly on the side from which the head is turned, unless when the patient looks forward, it is hidden by the angle of the jaws. On the side to which the head is bent it cannot always be felt, the finger sinking deeply inward and forward into the neck,

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\*Lancet ii 1906



the transverse process of the atlas has been displaced backwards. A similar observation must be made frequently on a sound but rotated neck; otherwise it is not easy to make. From the back, the spine of the axis, when it can be seen or felt, is deviated somewhat to the side from which the head is bent. This is not due to the fracture, but to the lateral curvature of the cervical spine, which is caused by the flexion and rotation of the head. The condition of the spine of the axis is of some interest, as sometimes it is more prominent than usual and at other times less prominent. The prominence of this spine is due to flexion and forward displacement of the head. Great prominence means much forward displacement of the head, and therefore the odontoid process is very likely to be broken.

An examination of the pharynx, preferably under chloroform, reveals two prominences, that on one side being due to the forwardly displaced transverse process, and that on the other, which is bulkier and less distinctly defined, being due to the part of the axis which has been denuded by the backward displacement of the transverse process of the atlas on that side. Attention has never been directed to these *two* points to be ascertained on examination of the pharynx.

A skiagraph of the lateral view of the head shows a forward displacement of one side of the atlas, owing to the transverse axis of that bone being oblique to the rays. It confirms the clinical observations. A most important thing is to ascertain if the odontoid process has been broken or not. If it has not, there is far less danger if a reduction of the dislocation is attempted, a proceeding which is dangerous if it is. This is not easy to make out, as the two lateral masses of the atlas when viewed from the side are normally one behind the other; in a rotatory dislocation they are seen laterally *en échelon*, obscuring the odontoid process. It is possible in most cases, especially in the recent one, to decide whether or not there has been a fracture. Later, the outlines of the bones become obscured from some

callus and inflammatory reparative formations. The integrity or otherwise of this process is extremely important to the life of the patient, as if intact it will lock between the anterior arch of the atlas and the transverse ligament. If it is broken there is little to protect the cord from an injury.

Anterior skiagraphs show nothing, and, owing to the rotation of the head and the patient's inability to open the mouth wide, a skiagraph of the odontoid process cannot be obtained.

The five points upon which to rely for a diagnosis are the *position of the head*, the *positions and fixity of the transverse processes of the atlas*, the *examination of the pharynx*, and the *skiagraph of the lateral view of the neck*. There is usually nothing which will absolutely exclude fracture of the odontoid process. If the process is broken, death may easily result from a sudden increase in the amount of the dislocation. If it is unbroken, it will lock with the anterior arch of the atlas and the transverse ligament, being a safeguard to the spinal cord. Mention has not been made of the differentiation of unilateral rotatory dislocation from an injury, to which I have lately directed the attention of the Clinical Society of London (*Transactions* 1906 and 1907), namely, rotatory subluxation of the atlas. The distinction is difficult to make in some cases, as the complete dislocation differs from the partial only in the 'quantity' of its symptoms, not in their quality. The subluxation is always reduced very easily when muscular relaxation is induced.

*Treatment*—When a diagnosis has been arrived at, and the probable condition of the odontoid process ascertained, the question is whether to reduce the dislocation or not. If the accident has already happened for a fortnight to a month, or the odontoid process is thought to be intact, an anæsthetic may be given. In a number of the cases spontaneous reduction occurs when the muscles are relaxed. In others gentle traction on the head and rotation will bring about the desired result. The head can be put up in a plas-

ter of Paris collar or in wood wool and bandages, which will be succeeded in a few days by a poroplastic collar. If, on the other hand, the odontoid process is thought to be broken, keep the patient at rest in bed with the head immobilized with sand bags, and three weeks to a month later give an anæsthetic to examine the pharynx and reduce the dislocation.

Should the surgeon not reduce the dislocation, the neck is put into a poroplastic collar. Movements in the neck will return, but will be limited. Operative treatment, unless to relieve symptoms of pressure on the cord, is not likely to be of much use.

The following case has been published as an instance of rotatory dislocation of the atlas occurring in prehistoric man. It cannot be accepted as an example of this injury and may be regarded a romantic narrative.

XX. ROTATORY DISLOCATION OF THE ATLAS IN PREHISTORIC MAN. BAUDOUIN. (*Compt. Rendu Acad. de Science*, Paris, 1904, cxxxix, 494-5).—A skeleton was found in a barrow at Vendée, which had a rotatory luxation of the atlas on the axis. It was a bilateral dislocation. As the skeleton was silicated whilst it lay *in situ*, and therefore before it was disturbed, the dislocation was thought to be the cause of death. The odontoid process was not broken. M. Lannelongue and others who were present at the séance at which the paper was read, thought that the dislocation had been brought about by the head turning with its own weight after decomposition had softened and loosened the muscles and ligaments. Thus the lesion was a post-mortem change and not an ante-mortem cause of death.

## OCCLUSION OF THE PORTAL VEIN DUE TO SURROUNDING INFLAMMATORY ADHESIONS.

BY GEORGE WALKER, M D ,

OF BALTIMORE, MD

Associate in Surgery Johns Hopkins University

ON account of its rarity and surgical significance the following is of sufficient interest to be reported

Female, age 67, family history negative

*Personal History*—Married at 17, four children, no complications The patient has never suffered from any serious illness. During the past fifteen years she has had occasional attacks of what was thought to be indigestion, these were accompanied by gaseous eructations, slight abdominal pain, malaise and headache There was no vomiting, no jaundice, no other disturbance On January 1, 1900, the patient underwent a sudden and severe shock, owing to the death of her husband and daughter, after this she became very much depressed, noticeably lost flesh and became anæmic The appetite was poor, sleep was disturbed, but there was nothing referable to any disturbance in the intestinal tract

*Present Illness*—On May 20, 1900, she was awakened early one morning by a severe pain in the right hypochondrium, which radiated towards the umbilicus and downward toward the pubis The pain was moderately severe, somewhat paroxysmal in type and lasted for two hours, but was entirely relieved by five grains of phenacetin There was no vomiting Several hours later the pain returned with increased severity, but fifteen drops of the tincture of opium relieved it entirely

According to the statement of her physician there was some rigidity of the muscles in the upper half of the right side of the abdomen, and over this area there was tenderness on pressure There was no tumor mass to be felt Constipation was present at the time and was complained of for some days following There was no jaundice at any time After this the patient lost flesh very rapidly, her appetite became poor, she suffered with constipation, alternating at intervals with attacks

of diarrhoea. There was no pain subsequently complained of, but on deep pressure in the right hypochondrium there was tenderness. Four weeks after the attack fluid was first noticed in the peritoneal cavity; this rapidly increased, the loss of flesh continued, the exhaustion became more and more marked and the constipation more obstinate.

Six weeks after the onset of the swelling—ten weeks after the attack—I first examined the patient. The abdomen was very markedly distended with fluid; respiration was distinctly interfered with; the muscle wall was everywhere soft and examination disclosed nothing but the large amount of fluid. The heart and lungs appeared normal; the temperature was normal, the pulse was 92, regular, but poor in volume. The tongue was slightly coated and the mucous membranes were pale. The face while distinctly emaciated was of a remarkably good color; there was no evidence of cachexia.

*Urinalysis.*—1100 cc. in 24 hours. Acid, pale straw color, specific gravity 10.22, no albumin, no sugar, no blood, no pus, a few epithelial cells, triple phosphates and urates in small quantity, no bile.

Stools: Soft, normal color, normal odor, no undigested food, no free fat.

A specimen of blood was taken, but owing to an accident the examination was not completed.

Six litres of a clear, pale straw-colored fluid were withdrawn from the abdomen. It was of a slightly reddish tint; there were no cheesy particles nor debris. Microscopic examination revealed a large number of red corpuscles; the fluid clotted readily. After removal of the fluid no change in the liver dulness could be made out, the lower border of the organ could be felt, it was smooth and regular. On deep palpation no mass could be felt, but there were tenderness and muscular rigidity. The spleen was not palpable, the dulness was not increased; neither kidney could be felt.

In a short time the fluid began to return and after five weeks three litres were withdrawn. This fluid contained no blood. Ten days afterwards the patient died.

A partial autopsy only was permitted. In the right hypochondrium a palpable mass was found as soon as the hand was inserted. This proved to be an inflammatory growth about

the size of an orange, which matted together the duodenum, the head of the pancreas, the gall bladder and the under surface of the liver. This mass surrounded the portal vein and common duct. The duct was patent, but the portal vein was pressed upon for about three quarters of an inch and entirely occluded, behind and before the occlusion there were definite thrombi. The gall-bladder contained about 20 cc of a turbid fluid and three irregularly shaped gall-stones about the size of hazelnuts. The wall was very much thickened and the mucous lining roughened. The cystic and common ducts were patent. The liver was of normal size and except that it presented the appearance of chronic passive congestion there was no change. The stomach and duodenum were not opened, they were not distended. A section of the pancreas appeared to be normal. The kidneys were not examined nor was the chest opened.

While it cannot be definitely stated what was the cause of this mass, it is probable that it was due to a pericystitis, resulting from a long continued inflammation of the gall-bladder. It is possible that a perforation by one of the stones may have occurred, but there was no evidence to prove this assumption. This inflammatory mass with its subsequent cicatricial contractions had caught and finally occluded the portal vein.

The ill-defined attacks of indigestion which had been complained of for fifteen years previously were probably due to the gall-stone and inflammation of the gall bladder. During the last attack something happened which allowed the surrounding inflammation to occur and formed the starting point of the inflammatory mass. This in turn by its occlusion of the portal vein interfered with the intestinal circulation, and caused the ascites and other symptoms noted during life.

An exploratory operation was thought of, but the extreme emaciation, anæmia and exhaustion present when I first saw the patient seemed to contraindicate any operative interference.

## OBLITERATION OF THE STOMACH AS A RESULT OF GASTRIC ULCER—DUODENOSTOMY.

BY JAMES B. BULLITT, M.D.,

OF LOUISVILLE, KENTUCKY.

P. R., male, age 40, was quite well and normal up to June 15, 1901, when he had a severe pain in stomach immediately after swallowing food, which persisted until the stomach was emptied by vomiting. From that time on he had constant pain in stomach whether the organ was empty or full. There was constant vomiting. There was no blood in vomitus or stools at any time. In the summer of 1903 he entered St. Edwards' Hospital, New Albany, and came under the care of Dr. Charles P. Cook. At that time there was manifest pyloric obstruction, the stomach outlines and washings showing marked dilatation. No tumor could be palpated. The stomach was washed out daily for two weeks, preparatory to a proposed operation of gastro-enterostomy, the patient gaining 15 pounds in this time. The patient felt so much improved that he left the hospital, refusing operation.

He was again seen in August, 1905. At this time, on making efforts to wash out the stomach, it was found that the tube could not be made to enter the stomach. The patient began to have great difficulty in swallowing food. He first gave up solids and semi-solids, and was finally reduced to only a teaspoonful of liquid at a time. Vomiting of ingested matter and mucus was continuous.

He finally came to operation on November 27, 1905. For four weeks before this time he had retained practically nothing at all by stomach.

The abdomen was opened in the mid-line, between ensiform and umbilicus. The stomach was exceedingly difficult of identification. A mass, the size of a medium-sized oyster shell, was detected buried in adhesions and occupying the site where the stomach should be. This was finally identified as the stomach by passing the stomach tube by mouth, with the mass between the fingers. The tube could be felt to enter its center, its intro-

duction being attended by the discharge of about a tablespoonful of evil-smelling liquid. The cavity of the stomach seemed to grasp the tube with some firmness. The mass representing the stomach was hard and smooth rather than nodular, and as already stated, was buried in adhesions.

The alternatives of attempting a gastrectomy in the face of the adhesions, or making an enterostomy, presented themselves. The latter was determined upon. A small slit was made in the descending portion of the duodenum, large enough to admit a small sized stomach tube. The tube was then inserted and buried in the wall of the duodenum for about two inches, the parietal peritoneum was sutured to the intestine along this same line. The incision was closed up to the tube which came through the incision at about its middle, being essentially the method employed by Witzel in making a gastrostomy.

The patient immediately received milk and broth through a funnel attached to the tube.

In the ten months since operation his weight was increased from 90 pounds to 130. His normal weight was 145 pounds. He eats everything, including meats, cabbage and sauerkraut. The food is taken into the mouth, chewed thoroughly until finely divided. A little coffee, tea or other liquid is then taken into the mouth and then the whole mouth contents is directed into a funnel connected to a tube previously passed about six inches into the artificial mouth.

At first immediately after the operation, an occasional slight diarrhoea occurred. For many months digestion and bowel function have apparently been uneventful.

There is practically no leakage from the fistula. The patient keeps a rag stopper in the opening between feedings in order to keep the opening dilated. Otherwise there is pain on introducing the tube. About six meals are taken daily.

For a time after operation when hunger was felt patient would occasionally try to swallow food. There would immediately be a sense of fulness and distention, evidently of the lower end of the oesophagus, and thereupon the ingested matter would be ejected. These efforts have long since been given up entirely. Every evening the gullet is washed out by taking a swallow of



water; this is immediately ejected, bringing with it a small quantity of mucus.

The condition presented in this case constituted a practical obliteration of the stomach. I think there can be no doubt that the process was one of chronic ulceration, with gradual contraction and so obliteration, attended by the formation of extensive adhesions around the stomach.

In making an enterostomy under such circumstances it is manifest that the higher up, the closer to the pylorus, the opening can be made, the better. In this case the cutting out of the stomach seems to have had no appreciable effect on the process of digestion.

In the early days of feeding, before the patient took the food into the mouth before injecting it through the tube into the duodenum, diarrhoea resulted. Since the food has been first taken into the mouth the bowel movements have been always soft and otherwise natural.

With the exception of this man's social disability, his necessity of isolating himself at feeding time, and the further necessity of more frequent feedings, he is comparatively as well off as if he had a pervious stomach. He states that the feeling of hunger is immediately relieved on receiving an injection of food.

The patient's future has been given careful consideration. Sufficient proof has been offered to cause an apprehension of cancer growth on every ulcer base, and this is certainly a possibility worthy of consideration in this man's case. As no food will come in contact with and continually pass over the sites of old ulceration, it seems reasonable to assume that the danger of ultimate cancer growth would be less in this case rather than greater.

Further operation in this case, gastrectomy with anastomosis of jejunum with oesophagus, would be extremely difficult and hazardous, owing to the stomach remnant being buried in such extensive and dense adhesions. It would probably be possible of performance. In such event

it would unquestionably be best to cut the jejunum square across, anastomosing the distal portion with the œsophagus, and implanting the proximal end in the side of the coil anastomosed with the œsophagus. The present artificial mouth could be then used advantageously for a time, and could be ultimately closed.

The patient's general condition is so good, and the outcome of such possible surgery so uncertain that I have advised him, for the present at least, to bear the ills he has rather than risk others he knows not of.

# TYPHOID WITH DOUBLE PERFORATION OF ILEUM AND PERFORATION OF GALL-BLADDER.\*

INTESTINAL SUTURE. CHOLECYSTECTOMY.

BY OTTO G. T. KILIANI, M.D.,

OF NEW YORK.

Surgeon to the German Hospital.

ON July 24, 1906, a patient, H. W., forty years of age, German, single, was admitted to the medical ward of the German Hospital with the following history:

The patient was too sick to inquire into family and previous history. For four weeks past he had complained of indefinite abdominal pain, diarrhoea, drowsiness and weakness; appetite has been poor. He has not vomited, no cough, no dyspnoea, no icterus, no night-sweats, no palpitation, normal urination. Eyes and ears normal. Temperature  $104.4^{\circ}$ , pulse 116, respiration, 28.

He was a poorly nourished male; face flushed, tongue coated thickly. Lungs: slight dyspnoea; no dulness, few rales over right base, subcrepitation. Heart: borders not enlarged. Abdomen: slight rigidity, marked tenderness on right side of abdomen, especially under right costal margin; slight rigidity of muscles over liver. Liver dulness reached  $2\frac{1}{2}$  inches below costal margin. Spleen palpable, soft, round edge; kidneys not palpable. Extremities negative.

*Diagnosis.*—Typhoid fever. Examination of the urine showed that through the entire disease practically normal conditions existed, except faint traces of albumin. Diazo stayed negative throughout. A few hyaline cylinders (casts).

Examination of blood, July 24:

|                       |              |                        |
|-----------------------|--------------|------------------------|
| Polynuclears. . . .   | 72 per cent. | RBC, 3,600,000.        |
| Lymphocytes. . . .    | 19 per cent. | WBC, 5,600.            |
| Mononuclears. . . .   | 4 per cent.  | Hb, 75 per cent.       |
| Eosinophiles. . . . . | 0 per cent.  | Widal, 1-50, negative. |
| Basophiles. . . . .   | 2 per cent.  |                        |
| Transitionals. . . .  | 3 per cent.  |                        |

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\*Read before the New York Surgical Society, October 24, 1906.

The case was accepted as suspicious of typhoid (ambulatory), and was especially carefully watched, as is the rule in the Hospital with these cases. The man had been admitted at 4 P. M. Next morning, July 25, at 2 30 A. M., about eleven hours after admission, the patient suddenly complained of extremely severe pain in the abdomen, as if he were being knifed, (*douleur à poignard*) and became extremely restless. The temperature within two hours dropped to  $99^{\circ} 8'$ , the pulse also dropped from 116 to 92. The night nurse reported the patient's condition to the house surgeon, who informed me, so that I saw the patient within thirty minutes of the sudden onset of pain. The abdomen showed absolute rigidity (*rigidité de défense*). The patient having received Magendie, no longer complained of much pain. In spite of the low leucocytosis, 5,600, in spite of the low pulse  $92^{\circ}$ , I made the probable diagnosis of intestinal perforation, solely on the strength of the sudden drop in temperature, the very distinct sudden sharp pain and the abdominal rigidity.

As there seemed to be very little shock, I decided upon immediate operation, against the general advice to wait if possible for twelve hours. Within twenty minutes operation was performed under anæsthol narcosis. Incision in the right rectus about 5 inches long, between umbilicus and symphysis. On opening the peritoneum a large quantity of yellowish fluid of slightly fæcal odor was found in the general abdominal cavity. A number of small yellow fæcal flocculi were to be seen on the intestines, which were of bright red color. The glands in the mesentery were plainly enlarged. In handling the small intestine near the colon, the thickened Peyerian patches could be distinctly felt with the fingers. About 10 inches from the ileo cæcal valve, two small perforations of the intestine were found, one complete and typical in its appearance, while in the other the ulcer seemed not to have perforated completely, nevertheless the probe found easy access into the lumen. Both perforations were closed with a number of fine silk Lembert sutures. While thus the operation was apparently finished (it took up to this point about twenty minutes), the very unusual bright yellow color of the abdominal fluid, which must have amounted to about a quart and a half induced me to lengthen the incision in the rectus up to the costal margin. Immediately the gall bladder presented itself, of a length of about 5 inches, with

a gangrenous fundus, showing two small perforations permitting the introduction of a medium-sized silver probe. The gall-bladder held rather closely two gall-stones of the size of hazelnuts. Cholecystectomy was performed in a few minutes, not presenting any technical difficulties (gall-bladder and cystic duct excised). The ligated stump was cauterized, a small gauze tampon put on the stump, another one in the lower angle of the wound over the intestinal sutures, the omentum placed as an apron over the sutured gut, and the entire abdominal wound closed. The operation lasted 45 minutes. The patient was brought to bed in very good condition, with pulse of good quality.

Blood examination, July 29:

|                    |              |                        |
|--------------------|--------------|------------------------|
| Polynuclears. .... | 72 per cent. | RBC, 4,800,000.        |
| Lymphocytes.....   | 20 per cent. | WBC, 7,400.            |
| Mononuclears ....  | 8 per cent.  | Hb, 80 per cent.       |
| Eosinophiles ..... | 0 per cent.  | Widal, 1-40, positive. |
| Basophiles. ....   | 0 per cent.  |                        |

July 29.—Cultures from gall-bladder: typhoid bacillus and coli.

July 30.—Blood cultures: bacillus typhosis in pure cultures.

The patient's temperature rose the day after operation. July 26, to 102.8° with a pulse of 124; on the 27th to 105°, with a pulse of 140; on the 28th to a temperature of 105.4°, with a pulse of 160; he continued to have temperatures for the next ten days between 104° and 105°; on the thirteenth day after operation remissions set in, the temperature varying between 103° and 100°, and the pulse between 120 and 112.

The man showed on the 28th and 29th symptoms of double broncho-pneumonia, with isolated areas of dulness over the left lung and dull tympany on right lung anteriorly from the fifth space to the eighth rib, below which flatness. Abdomen slightly distended, somewhat firmly held, not tender. Liver palpable 8 cm. below costal margin; edge sharp, smooth, not tender; jaundice clearing.

July 29.—Peritonitic facies continues; temperature 106.2°; general condition fair; tampons removed, not replaced; moderate drainage.

August 1.—General condition, good; took his nourishment

well, well retained, expels flatus freely, wound approximation good, moderate redness and induration about suture orifices, abdomen soft, not tender

August 8—General condition, fair, evening temperature still rises high, respiration rapid and shallow, nocturnal attacks of dry cough, icterus clear, took nourishment well, abdomen somewhat distended, soft, not tender, small granulating surface at the site of the two tampons, upper and lower angle of wound, remainder of wound healed solid per primary union, sutures removed

August 10—Right lung, dulness below sixth, flatness below eighth rib posteriorly, high-pitched bronchial breathing, many moist bubbling rales, sputa scant, brown, viscid, not fetid

From Aug 12 on, the condition became markedly worse the patient died, on the 16th of sudden cardiac collapse, with a temperature of  $99.2^{\circ}$  and a pulse of 136, twenty one days after operation

EXTRACT FROM AUTOPSY RECORD, Aug 17, 1906—Abdominal incision almost completely healed extends from 1 inch beneath ensiform process to 2 inches above symphysis, no other scars, no pigmentation, no œdema no jaundice Abdomen distended

Thoracic cavity situs normal

Pleural cavity (a) Right, filled with 12 oz of turbid yellowish purulent fluid, pleura very much thickened and adherent posteriorly (b) Left, contains several drachms of clear serous fluid no adhesions

Lungs (a) Right (1) Upper lobe apex shows several old calcareous foci, also several small tubercular cavities surrounded by connective tissue besides this, a large focus of gangrene (2) Middle and lower lobe congested (b) Left (1) Upper lobe apex in similar condition as on right side (2) Lower lobe congested

Pericardium normal Heart, slight myocarditis, heart muscle somewhat pale and flabby, no valvular lesions Thoracic duct normal

Abdominal cavity Intestines Small intestine presents a volvulus, comprising about 1 inch of intestine, the lower end 6 inches from ileocaecal valve, intestine above markedly distended with gas, below collapsed, the part involved purplish, peritoneal covering glistening, no evidences of intestinal sutures can be found, the mucous membrane shows no evidences of ulceration except about 1 inch from large intestine two small round ulcers one half the size of a split pea, punched out in appearance, margin not raised base smooth

Stomach normal, liver slightly enlarged and congested, gall-bladder absent, cicatricial connective tissue in its site, bile duct patent, spleen

congested, firm and enlarged, (8 x 4 x 4 inches), anterior margin shows two notches.

To sum up, we have here a case of unquestionable typhoid, proved by Widal being positive, by pure cultures from the blood, by anatomical condition of small gut observed during operation, and by culture of typhoid bacilli from extirpated gall-bladder (the latter proof not being absolutely conclusive, as typhoid bacilli have been found from three to four years after typhoid had been contracted).

The case is of the so-called ambulatory type, probably at the end of the fourth week, possibly later. Ten hours after admission, laparotomy is performed, as the diagnosis, intestinal perforation, is made. I must add here that owing to the rigidity of the abdomen at the time of my examination before operation, I could neither feel the enlarged liver nor the tumor of the gall-bladder with its stones. As it was night, the jaundice was not particularly observed. The operation revealed double perforations of ileum near the ileocæcal valve, which were closed by sutures, and perforation of gall bladder, which contained two large stones; the gall-bladder was extirpated. The patient stood both operations remarkably well, overcame his peritonitis and lived through his violent type of typhoid to die twenty-one days after operation, of gangrene of lungs and empyema, both probably of tubercular origin.

As to the diagnosis of perforation, a few words are to be said. If the case had been under observation longer, and not only ten hours, as was the case, the diagnosis of perforation of the gall-bladder might have been thought of. Whether anybody would then have thought of intestinal perforation besides, is questionable. I think, generally speaking, as well as under the existing conditions, one has every reason to be satisfied if perforation as such is recognized early enough. Cushing, Russell, Osler and others have called attention to the point that the status of leucocytosis is an exceedingly unreliable diagnostic point. In our case it proved to be only 5,600; besides this,

the pulse, instead of being, as typical, very high, contrasting with the low collapse temperature, was also low, viz, 92. But this meant to me simply that the man had not developed a peritonitis as yet. Altogether I based my diagnosis of abdominal perforation mostly on the sudden, very marked pain, combined with a fast drop of temperature and rigidity of the abdominal muscles. As Osler says, one must operate when one has a probable diagnosis. To wait till all the symptoms of perforation are established, means to kill the patient. "Ce sont les medications qui tuent, par le temps qu'elles font perdre"—Lejars.

As to the sequence in which the perforations occurred, whether the gall-bladder or the intestine showed perforation first, with its influence on the abdominal cavity,—I dare not offer an opinion, nor about the point, which perforations produced the violent symptoms leading to an operation. We must be satisfied with the proven fact that in a case of typhoid the gall bladder and the small intestine were perforated practically simultaneously.

One point of the post mortem needs explanation, and that is the *volvulus* which was found at the time of the autopsy. The report of the pathologist as well as the verbal report of Dr. H. Fischer, my adjunct surgeon (I myself was not present), indicate that the *volvulus* was not complete, so as to be fatal; it was somewhat permeable. Whether its formation had anything to do with the intestinal sutures—of which no signs could be found—is an open question, but deserves our attention. Theoretically, the possibility cannot be denied, that the suturing of two holes in the gut only a few centimetres distant from each other, might produce a kink, which could eventually lead to an incomplete *volvulus*.

As far as accessible to me, I have looked up the entire recent literature on operations in typhoid complications, and have been unable to find a case like the one I have reported. There is one case reported in the *Philadelphia*



*Medical Journal*, 1901, by Hermann B. Allyn, where a typhoid case (admitted probably in the second week) was operated ten days after admission for intestinal perforation. The perforation in the gut was not found, nor a perforation in the gall-bladder, although its region had been examined digitally. The patient died three days after operation of peritonitis. The autopsy revealed an opening 1 cm. in diameter in the gall-bladder, communicating with a small opening in the hepatic flexure of the colon, 5 mm. in diameter. I mention this case only for the sake of completeness, as it has very little in common with my own. The simultaneous perforation of gall-bladder and colon was apparently produced by a contact infection, the perforations were both not found during operation, and the patient died of peritonitis.

Erdmann, in his paper on primary typhoid perforation of the gall-bladder, read before this Society in February, 1903, had collected up to that time seven cases of perforation of the gall-bladder which had been operated upon, of which four cases recovered.

While the literature of intestinal perforations in typhoid has increased considerably in the last years, reports on perforations of the gall-bladder have been very scarce,—we find one by Park Weed Willis, Seattle, Washington, in *Northwest Medicine*, 1904, where perforation of the gall-bladder was found, and the perforated gall-bladder, containing no stones, was stitched into the abdominal wall. The patient died two weeks after operation of peritonitis, which the author ascribes to obstructions from adhesions, for which he operated shortly before death. His description of the case does not prove to me that the peritonitis was due to adhesions, but rather to his failure to extirpate the gall-bladder at the first operation.

Zesas, in his extensive paper published in the *Wiener Klinik*, 1904, "Ueber die Resultate der chirurgischen Therapie der typhösen Perforationsperitonitis," gives statistics of 250 cases operated for perforative peritonitis,

with 95 recoveries, but no perforation of the gall-bladder is to be found among them

As stated above, a rather careful perusal of the American, English, German and French literature since 1903 has failed to show any further publications reporting operations for perforation of the gall-bladder in typhoid, while an operation for apparently simultaneous perforation of the gall bladder and ileum in typhoid seems to be unique

## INTESTINAL INTUSSUSCEPTION.\*

BY ROBERT C. COFFEY, M.D.,

OF PORTLAND, OREGON.

Surgeon and Medical Director of the North Pacific Sanatorium.

INTESTINAL intussusception is one of the last of the serious intestinal lesions to yield good results by surgical means, and yet the very nature of the trouble makes it purely a surgical disease. The general mortality of this malady has been variously estimated at from seventy per cent. to ninety per cent. and modern surgery has not so far lessened it to any great degree. This, I believe, is due to the fact that we are relying largely upon the mortality tables of the older operators which were compiled before the inauguration of modern methods in intestinal surgery. A few years ago some authorities estimated mortality of gastro-enterostomy at thirty per cent., or considered an intestinal excision as an exceedingly serious matter. To-day the mortality of these operations in the hands of surgeons doing a great deal of that work is not materially greater than the operation for appendicitis. The great diminution in the death rate in this latter class of cases is due, first, to the fact that formerly the conditions were not diagnosed until the patient was moribund. Secondly, the technical methods of operating were deficient. Now the diagnosis is made earlier, while the patient yet has vitality, and the operation is done more skilfully—hence the lessened mortality. The conditions mentioned above, which existed in stomach surgery ten years ago, still exist in relation to acute intestinal obstruction. Progress in the treatment of this class of cases has been delayed longer than in stomach cases because of the acuteness of the condition, thus depriving the practitioner of time for deliberate study of his case and preventing his making a diagnosis until the vital-

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\* Read before the Idaho State Medical Society, October 5, 1906.

ity of the patient is exhausted while diseases of the stomach and gall bladder are usually chronic and allow time for deliberation and investigation. Intestinal intussusception or invagination which comprises more than thirty per cent of all acute intestinal obstructions is more fatal than other forms of obstruction because of greater difficulty in making an early diagnosis. In most other forms of intestinal obstruction the occlusion of the lumen of the bowel is almost or quite complete which is not the case in intussusception. The one misleading feature in intussusception is that in a great many cases the obstruction is not complete and the bowels act gas passes and there is little or no distension. Another reason for the great mortality is that it most frequently occurs in children and the practitioner is at a loss to differentiate between this condition and an ordinary gastro intestinal disturbance or colic for before he is called some one has given a large dose of castor oil which may have been effectual. Thus the doctor is misled until the patient is almost dead an infant is a poor subject in acute abdominal diseases for surgery.

Without going into detail I think we can say in a general way that the three most frequent causes are (1) A congenital laxness of the structures in the neighborhood of the ileocaecal valve \* (2) A partial or complete intestinal obstruction by a growth or some form of constriction (3) The presence of a pedunculated tumor within the lumen of the intestine. All these causes are made effectual or active by the normal peristaltic action of the intestine which tends to grip any foreign or unusual body and force it on down the intestinal tract. It has been my fortune to have seen quite recently cases of intussusception produced by each of these causes. I may mention two cases of the first type.

One was a three year old child in which there was not more than an inch of invagination. There was very little ob

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\*Thus the writer has studied with interest in intestinal experiments in which the motor nerves of the intestine had been cut thereby producing paralysis and intussusception.

struction and almost no trouble in reducing it. The symptoms were nausea, vomiting and pain in the neighborhood of the umbilicus, which symptoms had existed for several days. Marked marasmus existed. Cathartics, however, produced results. The diagnosis was not made positive until the abdomen had been opened. The intussusception was easily reduced and the intestine was sutured to the mesentery, thus partially rolling the intestine up in its mesentery, as shown in Fig. 1., to prevent recurrence of intussusception. Patient recovered.

Another case was one in which the patient was nine years old and in which the cæcum, appendix and ileocæcal valve had formed an intussusception. This was very acute and had only existed a few hours. The condition was so acute as to require the services of a physician from the very beginning. The patient suffered with great pain and distress, resembling an acute appendicitis, but as there was a decidedly palpable tumor so soon after the onset of the attack, we were able to rule out appendicitis. It was easily reduced and the cæcum was sutured to the peritoneum in its neighborhood, as recommended by the authorities, and the ileum was rolled up in its mesentery as shown in Fig. 1. Patient recovered.

The third case was that of a Chinaman about fifty years of age. This was due to the second cause mentioned above. I was called in consultation with Drs. Locke and Gullette. The patient had had no action of the bowels for thirteen days and was in an extreme condition. Within twenty-four hours preceding operation a tumor was discovered protruding through the anus which examination proved to be the apex of an intussusception. We did an abdominal section, and, by pushing up from below through the rectum, we were able to reduce the intussusception but found practically a complete obstruction which proved to be a carcinoma involving almost the entire circumference of the gut at the sigmoid flexure. So we did an incision and an anastomosis which was very effectual, as was shown by his passing a large quantity of dark malodorous fæcal matter by the anus at once. He lived for more than two days and then died of stercoremia and peritonitis. While this was a very desperate case, I feel that if I were doing another case, I would not perform the operation in exactly the same way, but would prefer to do it in two stages. The point I wish to illustrate by this case

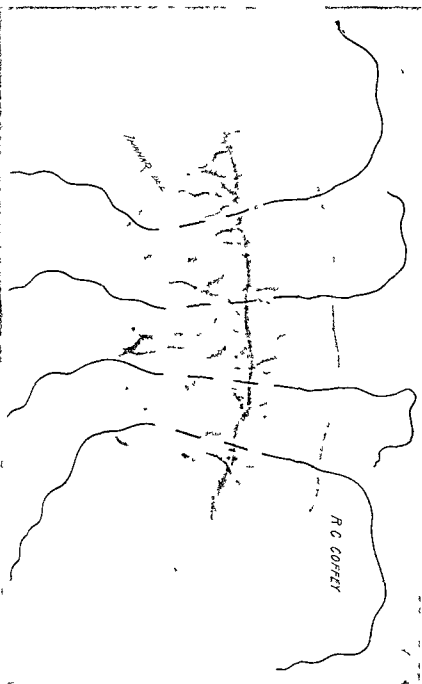


Fig 1 —Roll i g intestine in its mesentery to prevent recurrence of intussusception



is that a movable tumor, even though it is in the form of a stricture, is a prolific cause of intussusception, especially if in the region of the sigmoid flexure

The last case which I wish to relate, and which was the subject from which the accompanying pictures were made, is a classic one in many ways. I have therefore attempted to illustrate it. Fig 2 illustrates the pathological conditions existing. The case has several ideal features as far as description is concerned. First, it is a simple and yet extensive intussusception and involves that part of the intestine most frequently affected. Second, it has the most ideal cause, viz, a pedunculated growth within the intestine on which the peristaltic wave may act. Third, this particular growth happens to be a structure which has often hitherto been overlooked (a Meckel's diverticulum), which in this instance was inverted. (Authorities generally agree that a Meckel's diverticulum is present in some form in two per cent of all human beings, therefore it is probably the cause of more cases of intussusception than we have recognized.) Fourth, it is ideal in its pathologic termination, viz, gangrene was produced. Fifth, it was ideal in that the lumen was still patulous despite its great length. Sixth, we used what in my opinion is the ideal treatment for a gangrenous intussusception (radical removal), notwithstanding the reports of most of the operators indicate its inadvisability. The history of the case is briefly as follows, as related by the patient's mother

Patient aged 7 years. When he was two years old he had severe cramps with cold perspiration standing out on his face and body, lasting about thirty-six hours. During the attack, enormous doses of cathartic medicines were administered, most of which were vomited. Finally an action was produced which contained quantities of blackberry seeds, and to their presence was attributed the attack by the physician and the people. During this attack he vomited every few minutes. From this time he had an attack about every month, varying in severity, but one striking feature was that he always passed blood at every



attack. Sometimes his attacks would occur every week. This state of affairs kept up for four years, when he had a very severe attack, with jaundice, and passed a lot of blood. This attack, which was about one year ago, began at 7 A. M. (and we may here state that all the attacks began at this time of day). In the afternoon at 6 P. M. he was better, and was better the next day. He never had fever during any of these attacks. From this one, just described, to the beginning of the present, he had light spells, no blood passing. Three weeks prior to this final attack, he had one which was quite severe, but which lasted only a few hours. This time he did not vomit but was nauseated.

On Sunday, June 8, 1906, he had a very severe attack, screamed with pain, had great pallor, and cold perspiration. Vomited every few minutes during the day. Was better, apparently, at 4 P. M. when cramps ceased, but vomiting continued until 7 P. M. Then he was hungry and was given bread and milk, but the soreness in his bowels did not cease as usual, and on Monday he remained in bed with but little appetite. On Tuesday he was still sore but was up a portion of the day, his bowels acting without a cathartic. Wednesday he played vigorously and was apparently as well as usual. Friday morning at 7 A. M. he was seized with a very severe attack, similar to the others, when his mother began to give castoria in large doses but found it was not effectual as it had been in previous attacks. Dr. Alice Hall Chapman, of Woodland, Washington, was called at this time and arrived at 12.30 P. M., remaining for two hours, injecting salts, castor oil, etc., and finally suspending him by his feet for an hour to cause the enemata to go high in the bowel. Finding this inefficient she advised them to bring him to the hospital, which, owing to the out-of-the-way place and poor facilities for travel, required a good deal of time to reach Portland. On the way to the hospital his bowels acted and he passed some gas and very dark fluid and faecal matter, but nothing that could be identified as blood. After this he had no pain. He arrived at the hospital at noon, Saturday, June 14.

On admission he presented sunken features and the characteristic expression of a serious abdominal trouble. There was no distension. A large mass was palpable on the right side extending up under the ribs. He was taken immediately to the operating room and the abdomen opened. The intussusception

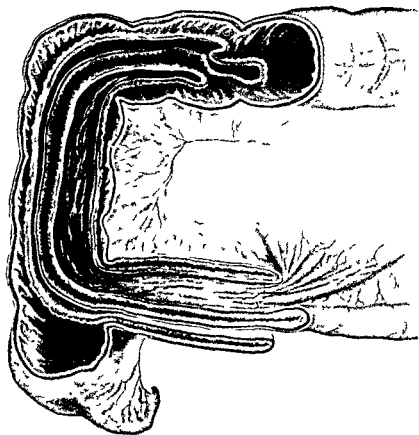


FIG. 2—Sectional view of extensive gangrenous intussusception due to an inverted Meckel's diverticulum



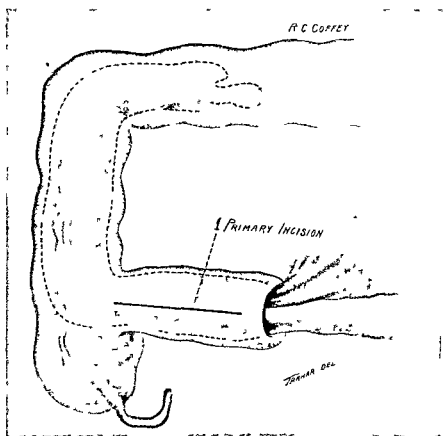


FIG 3—Diagram showing incision through which intussusceptum was removed (indicated likewise in succeeding pictures)

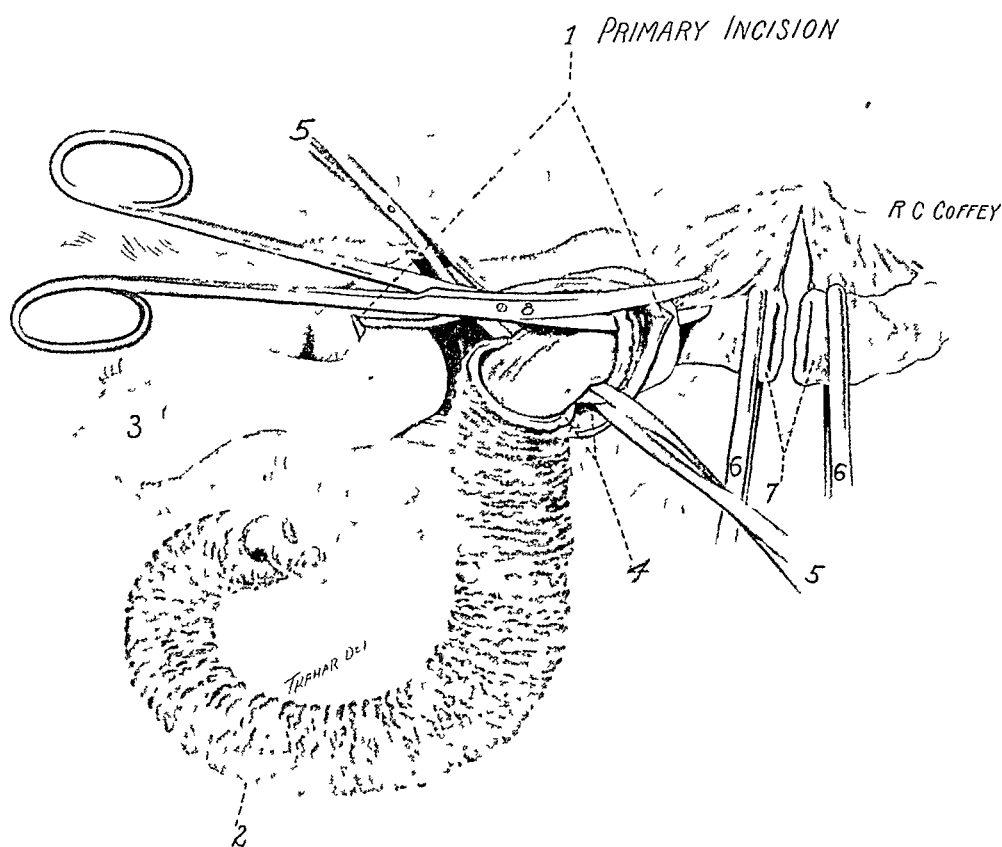


FIG 4—Steps in operation 1 Make primary incision indicated in Fig 3 2 Withdraw intussusceptum and wrap in gauze 3 Pick distal end of intestine with gauze 4 Cut middle layer of intussusceptum by circular incision 5 Catch bleeding arteries with forceps 6 Clamp healthy intestine with two forceps 7 Cut between forceps 8 Complete primary incision, laying open distal end of the ileum and freeing intestine to be removed

DISTAL END OF ILEUM

10

12

DR. MARY ING & SON PARTLY SUTURED

9

R. C. COFFEY

1. L. M. & P. A. 435

PROXIMAL END OF ILEUM

T. MAR. 1911

FIG 5.—Steps in operation of Pausu end of the ileum of L. ga. e mesenteric section. Cut mesentery and remove gangrenous intestine. Suture proximal end of ileum.

R C COFFEY

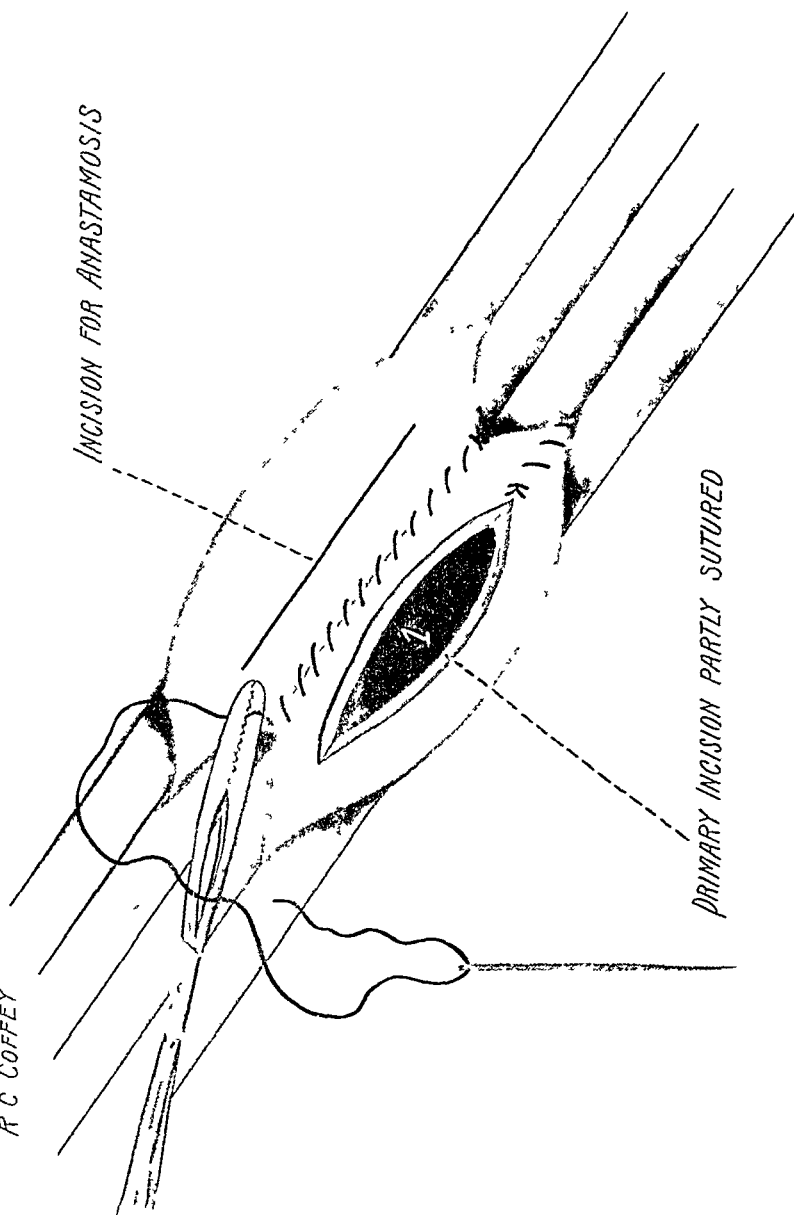


FIG 6 -Make lateral anastomosis between the proximal end of the ileum and the distal end of the ileum at the primary incision by the method usually used in doing gastro enterostomy.

shown in the picture was found and identified. The abdomen was packed full of gauze to prevent exposure of the other intestines. We then tried for several minutes to reduce the intussusception but found it impossible, so after packing many layers of gauze and delivering the affected part of the intestine to the surface, we made the primary incision (1) as shown in Figs 3 and 4, and mopped out all the fluid in sight. We found the enclosed intestine gangrenous and that there existed a constriction at the ileocæcal valve, necessitating a partial cutting of the valve. (2) The intussusception was then withdrawn and wrapped in gauze. (3) The fluid inside the intestine was mopped out with sponges and a long piece of gauze was packed into the cæcum to prevent regurgitation of intestinal contents. (4) The second layer of intestine was cut in two in its circumference. (5) The edges of the intestine were clamped at the bleeding point to control hæmorrhage. (6) The ileum was then clamped and (7) cut. (8) The cæcal stump of the ileum was slit wide open with scissors by extending the primary incision. (9) This was sutured partially, leaving an opening large enough for an anastomosis (Fig 5). After this the gangrenous portion of intestine was left hanging by its mesentery only. (10) This was ligated in sections and (11) cut with scissors. (12) The proximal end of the ileum was sutured and the clamps removed. The distal and proximal ends as indicated were brought together and an anastomosis was made with clamps, as shown in Fig 6. The patient was not seriously shocked by the operation, but very small hopes were entertained of his living. The next day his temperature went to the neighborhood of  $106^{\circ}$ , which symptom is pointed out by Barker as being peculiar to these cases. This patient made a complete recovery and has remained so for four months.

For some reason radical operation has not been as successful as we would naturally suppose, and most of the cases of gangrenous intussusception are fatal. Barker has devised a means of cutting off the intestine within the intussusciens, suturing the peritoneal layers together as they lie in contact, and then suturing the edges of the peritoneum at the beginning of the intussusception. I believe it is not considered to be very effectual in gangrenous cases. This operation has found considerable favor in



the hands of most surgeons and is considered a good compromise between no operation and radical operation, but has the disadvantage that, even if the patient recovers, a stricture is likely to occur which finally requires a secondary operation or produces death. Treves states that cases where suturing has been carried out, whether gangrenous or not, have had a mortality of about 86 per cent. Concerning the gangrenous cases, Moynihan quotes Barker as saying "He had never seen recovery after resection in gangrenous cases and never expected to see it. The only hope lay in early operation."

We are prepared to agree with Mr. Barker that the only hope for greatly reducing the mortality in these cases is in early diagnosis and early operation, which, like appendicitis, if done in the first twenty-four hours is usually found reducible and with not a very large mortality, except in young infants. The harm is done by the use of cathartics and the temporizing with all kinds of remedies, hoping to finally avoid operation, when in reality the surgeon should be called as soon as the trouble is suspected. If the surgeon occasionally opens an abdomen in which there is no obstruction he will do very little harm. The results in this case here related have strengthened the belief that I have held for some time that there should be no great difference in the excision of a gangrenous intussusception and a gangrenous intestine under other circumstances. The method here described was adopted for the occasion and is applicable in cases of extensive gangrenous intussusceptions in which too much intestine is involved in the intussusciens to justify excision of the entire mass, including the intussusciens. I am of the opinion that radical excision for gangrenous intussusception will in the future be done more frequently and successfully than it has in the past, though, of course, a conservative compromise will be necessary in many cases. I believe the method described in this case is cleaner than any other method I have seen described for extensive gangrene, and I would certainly do the operation in a similar manner in another similar case.

## RESECTION OF TEN FEET, TWO INCHES OF SMALL INTESTINE, WITH RECOVERY.

BY EDWARD STAEHLIN, M D,

OF NEWARK, N J

J T, a man, aged forty seven, married, native born, fireman by occupation, a strong, healthy man actively engaged in his work, who never had been sick. The only bodily infirmity he has had was a large indirect reducible hernia on the right side. This he had had for thirty years, during which time it had always been reducible.

On the morning of February 25, 1906, while turning over in bed, he experienced a sharp pain in the region of his hernia, and for the first time since he had it was unable to reduce it. The pain grew rapidly worse (this was 7 A M) and vomiting set in at once. Assistance was summoned, but the hernia could not be reduced. The pain became excruciating and vomiting was continuous. He was sent to the City Hospital at 11 A M and operated upon at once.

The protrusion was as large as a good sized head and very tense, and tympanitic on percussion. The pulse was fair, temperature subnormal, the facial expression very anxious and decidedly pinched. He vomited and retched continuously. On exposing the gut the coils brought immediately to view were gangrenous, and the underlying coils were highly congested and gangrenous in places here and there throughout their entire extent. The entire mesentery involved had turned a deep mahogany color, the veins were thrombosed, and the arteries had ceased to beat. The condition of affairs was evidently as follows. There was a tremendous hernia of the small intestine which had come down. This had always been readily replaced through the greatly enlarged ring, but on this particular morning, while in the act of turning over in bed, an additional knuckle of gut was forced into the ring in consequence of the increased intra-abdominal pressure prompted by the muscular exertion in the act of turning over, and so the ring was effectively occluded and caused strangulation.

The entire length of gut which contained gangrenous areas

was securely clamped off and removed. Then the mesentery was ligated and resected close up to its upper attachment. This latter was ligated by a series of interrupted chain ligatures of catgut. The ends of the gut were then approximated and reunited by end-to-end anastomosis; celluloid was used as suture material. Two layers of sutures were done, the first through-and-through and the second layer through muscular and serous coats (Lembert). The remnant of mesentery was then approximated and the gut was dropped into the abdominal cavity. Gauze drainage was used.

The patient rallied well and the dressing was changed for the first time one week after the operation. Three days later when the dressing was changed gas escaped through the wound; on the following day there was a fecal discharge. From this day on the wound was dressed daily and in nine days the fecal fistula had closed.

He was discharged cured in seven weeks. His convalescence was watched with a great deal of apprehension lest the stools should become permanently liquid and so cause gradual inanition. This was not the case, however, and within two months after his discharge from the hospital he resumed his duties as a fireman. He still wears a truss, as the attempt for radical cure was abandoned on account of the conditions encountered.

He eats and drinks as before and has regained his former weight.

The entire length of gut removed was ten feet two inches, and it was taken as nearly as could be made out from the middle of the small intestine.

# FRACTURES OF THE OS CALCIS AND ASTRAGALUS.

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AND

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WE have been led to undertake this study, because during the last few years many cases have come to our notice in which a failure to accurately diagnose the condition has led to results certainly less good than might have been obtained by better directed methods. At the outset of the investigation we supposed these fractures to be uncommon, but this opinion we have been obliged to change and now incline to the view that they are more common than has been generally supposed.

Our deductions are based upon the study of 111 cases admitted to the Massachusetts Hospital during the last fifteen years. In many cases the notes are not sufficiently accurate to permit conclusions to be drawn upon many of the minor points, and we have confined ourselves in most instances to the discussion only of those cases in which we have personally studied the X-ray plates or been able to examine the patient a considerable time after the injury.

*Etiology*—Age, occupation, and sex. As might be expected the occurrence of these fractures follows the rule common to all severe fractures, that they occur more frequently in those whose age and occupation expose them to external violence. Thus no fractures in this series occurred in children, very few in women, the vast majority in men in the prime of life.

*Frequency*. No method of estimating the frequency with

which any fracture occurs is wholly satisfactory, as the situation of the observer, the class of population with which he has to deal, and entirely accidental causes, influence the number very greatly. It may, however, be of interest to note that during the last eleven years there have been in the hospital 83 cases of fractures of astragalus and os calcis, 204 cases of Potts' fracture and 396 cases of fracture of the femur.

Method of Production: To decide by exactly what mechanism these fractures are produced, is a matter of more than ordinary difficulty, for the various factors entering into the question are many and it is practically impossible accurately to estimate the value which should be given to each. The problem differs materially from that in fractures of long bones or bones not situated in such immediate proximity to many complicated joints. It would obviously be important, were it possible, to know the exact position of the foot at the moment the force was applied. Thus, theoretically at least, the amount of extension, the presence of inversion or eversion, the condition in regard to tonicity of the various muscles acting upon the foot, and the strength of certain ligaments, must be known if we are to arrive at a correct estimate of these various factors. While much ingenuity has been expended in the attempt to give to these factors their correct importance, it does not seem to us, with the data at hand, possible to apportion their value with sufficient accuracy to yield valuable results. It is, however, entirely possible, and quite important, to note in general how these accidents occur.

Fractures of the Os Calcis: These fractures are in the great majority of cases true compression fractures, and are generally due to a fall from a height on to a hard substance, as the ground or the floor of a building. The bone is crushed between the astragalus above and the ground or floor beneath, the astragalus being protected from the direct force of the blow by its situation between the two malleoli, and probably also by the crescentic contour of its upper surface, which tends to distribute the force of the blow. Some of the observations upon this point by our Continental brethren are not without their

humorous aspect One gentleman, for instance, gravely assures us that if a man falls from a height of fifteen or eighteen feet onto a stone floor, the os calcis will be broken, provided, always, that the floor does not give way The bone may also be broken by direct violence, as in the case of one patient, whose heel was caught between the curb-stone and the wheel of a wagon, or by weights falling upon the foot so as to strike upon the side These are not, however, common methods of production In our series there are sixty-three cases in which the nature of the accident is described Of these, fifty nine were due to falls from a height, and four only were produced by direct violence

*Astragalus* As we have already suggested, the protected position of this bone makes it less likely to be broken by crushing strains, but it is nevertheless frequently fractured in this way Thus Hamilton<sup>1</sup> in ten cases, found that nine were due to falls from a height and Gaupp,<sup>2</sup> in sixty one cases, found that forty-five were produced in this way In our series the method of production was known in thirty-five cases Of these, twenty one were due to falls from a height and fourteen to direct violence, (see Fig 20) This appears to be a considerably larger proportion than that noted by most previous observers but the series presented by Hamilton is too small to warrant accurate deductions, and our series is sufficiently limited, so that the proportion of three to two is likely to err considerably in either direction It is important to note, however, that the proportion of the fractures of this bone due to direct violence is much greater than that of the os calcis

*Pathology*—Our knowledge of the pathology of these fractures must be derived largely from the study of X-ray plates as the number of cases in which the accident is fatal—and it is possible to study the exact conditions at autopsy—is very limited and the position of the bones is such that little reliance can be placed upon inferences drawn from examination with the fingers It is perhaps not too much to say that most of the errors occurring in diagnosis result from too much

dependence being placed upon methods of examination other than the X-ray. It would be an endless task to attempt to describe all the possible fractures of these bones, and we have not ourselves felt competent to decide, even from a careful study of an excellent series of X-ray pictures, the exact details of the fracture in many cases. Certain general types of fractures, however, can be distinguished, and we have made our classification rather with a view to the possibilities of treatment than following the lines of previous observers.

Os Calcis: We have been able to distinguish three general types of fracture of this bone—(1) That in which the fracture has been confined largely to that portion of the os calcis lying behind a vertical plane through the middle of the body of the astragalus. These we have described as heel fragments. They may be further subdivided into (*a*) cases with one large heel fragment (see Figs. 2, 3 and 4), (*b*) cases of small heel fragments which practically correspond to the avulsion fractures of other authors (see Fig. 6), and (*c*) cases showing cracks or fissures in the portion of the bone above noted, which, had the injury been more severe, would have resulted in the breakage of heel fragments (see Figs. 7 and 8). (2) That in which the force of the blow has been expended upon that portion of the os calcis lying beneath the astragalus, in front of above plane—in other words, roughly, the anterior half of the bone. These we have described as comminution of the anterior half, as in our series all the cases show comminution (see Figs. 10 and 11). (3) In this class we have placed those cases in which the whole os calcis is crushed and converted into what might be described as a bag of bones, the fragments being held together, apparently, only by the shreds of periosteum and by the surrounding soft parts. The bone is literally shattered. These cases we have described as completely comminuted (see Figs. 12 and 13).

In only nineteen cases have the X-ray plates been sufficiently perfect so that accurate deductions could be drawn. Of these, Class 1 (heel fragments) contains eight cases; Class 2 (the cases of the anterior comminution) contains five cases;

Class 3 (the completely comminuted cases) contains six. From this it appears that Class 1 is slightly more common than either of the other classes but the difference is not sufficiently great to justify conclusions.

As fracture of the sustentaculum tali has been frequently mentioned by other observers, it would be improper to pass it without mention. It belongs however, to the anatomical rather than to the clinical method of classification, and while it is by no means improbable that such fractures might take place even without other damage to the bone we have seen no cases in which this has occurred as a distinct type. In many of the cases—notably, those in Class 3—there is undoubtedly fracture of this process but as it is only an incident of the whole injury and not in itself important, we have not been inclined to give it prominence. Our study of the X ray plates makes us doubtful whether we could distinguish such a fracture if it occurred and to identify it by any other name is to depend upon mere guess work.

**Astragalus.** The classification of fractures of the astragalus is much more simple than those of the os calcis. The position of the bone is such that it has a protected part and an exposed part the body being largely protected by its position between the malleoli and the neck, exposed particularly to violence giving a twisting strain or to crushing blows falling in front of the body.

1 **Fractures of the Neck**—This is much the most common fracture of the astragalus (see Figs 18, 19 and 20). Gaupp in forty nine cases saw it eighteen times, and in our series it occurred in ten out of fifteen cases in which the plates were satisfactory. Of these cases, five were due to falls, five due to direct violence.

2 **Fractures of the Body**—This fracture is due to a crushing force similar to that which results in fracture of the os calcis sometimes occurring with the latter, and it is difficult to decide what factors influence its production. The variety of fractures is very considerable, varying from two large fragments to complete comminution of this portion of the bone.



It has not, however, seemed to us that a more minute classification was important from the point of view of treatment. In our series of fifteen cases it occurred five times, always from falls (see Figs. 21 and 22).

*Os Trigonum*<sup>3</sup>: No discussion of fractures of the astragalus is to-day complete without some reference to this curious little bone, which is sometimes attached to the astragalus as a process, on its posterior aspect, sometimes entirely detached, and joined only by a cartilaginous union, sometimes partially fused, showing that it had previously been detached. Its importance lies largely in the fact that when displaced upwards as a result of injury to the foot, it is frequently described, from an examination of the X-ray plates, as a fracture, and it is always wise to bear the fact of its occurrence in mind and not be misled by the appearance of an apparently isolated fragment just behind the posterior border of the astragalus (see Fig. 17).

*Diagnosis*.—An extended discussion of the methods of diagnosis in fractures of these bones would be out of place here, as they differ in no essentials from those applied to fractures elsewhere. We wish, however, particularly to draw attention to the fact that these methods have been so inaccurate as to prove conclusively that they are not to be depended upon. Thus, Ehret<sup>4</sup> in a series of forty-seven cases, found that only three had been correctly diagnosed immediately after the injury. In our series of sixty-six cases of fracture of the os calcis, a large majority of which came directly to the hospital and were under the care of a skilled staff with most modern methods at their command, seven cases were wrongly diagnosed and as a result wrongly treated. Of these seven cases, two were hospital cases and five had been under the care of other practitioners; three were regarded as sprained ankles, one as a Potts' fracture, one as a dislocation, two apparently as simple bruises of the foot. As will later appear, the results of the treatment of these fractures are so bad that no method which will lead to their more accurate treatment should be

neglected The tenderness and swelling are such that even in the most skilled hands accurate diagnosis is entirely impossible except by means of the X-ray, and we believe that no case can be considered as having been properly diagnosed until a satisfactory X ray plate has been examined

In the case of the astragalus, in thirty eight cases three were wrongly diagnosed—all of these by practitioners not connected with the staff One was regarded as a contusion, one as a sprained ankle, one fell into the clutches of a 'natural bone setter,' who failed to set the bone All these cases were fractures of the neck, which theoretically should be easier to detect than fractures of the body of the astragalus or of the os calcis The statement made above in regard to the use of the X ray in fractures of the os calcis is equally true and its effect upon treatment is even more marked, as accurate diagnosis will enable the surgeon to decide exactly what condition he has to deal with and what measures must therefore be taken This will be further discussed under "Treatment"

*Prognosis*—We cannot better illustrate the probable outlook in these cases than by discussing the results which have actually been obtained in the cases under our observation We have been much impressed by the fact that the majority of the results are not good as compared with most other fractures, and we have thought that in some cases, at least, somewhat better results might have been obtained by different methods of treatment

The cases which we have used in this classification are only such as we have personally examined more than one year after the injury Many of them were seen more than three years after injury, so that we believe we have obtained a fairly satisfactory view of the ultimate results We have classified the results as "Good," "Fair," and "Bad," which terms we have defined as follows

1 Good—Those cases having a useful foot without pain, or at least without much pain None of them are entirely

normal, and in the great majority there is marked limitation of lateral motion (see Figs. 4, 5 and 9). In our series at least, no case was seen with anything approaching a return to normal condition of the bones.

2. Fair.—Those cases in which the patient has been able to return to work and in which his earning capacity has been but slightly impaired, but in which pain, some disability, and the necessity for wearing pads, plates, or other form of apparatus, have been present (see Fig. 3).

3. Bad.—Those cases in which there is marked disability and the earning capacity has been distinctly diminished (see Fig. 16).

Os Calcis: We have been able to examine twenty-six cases in which the end result of the injury was known and the patient personally seen more than one year after injury.

These showed: Good result, 13, or 50 per cent.; fair result, 10, or 38 per cent.; bad result, 3, or 12 per cent.

Examining these cases more closely, with a view to determining what type of fracture gave the best result, the X-ray plates have been sufficiently satisfactory in twelve cases. Of these, seven were classified as "heel fragment" cases, and of these 5 were good, 1 fair, 1 bad.

Five cases were classified as "comminuted." Of these, none were good, 4 fair, 1 bad.

It seems, therefore, just to conclude that the cases classified as "heel fragment" cases show a better end result than the cases with much comminution.

Astragalus: We have been able to see and examine eight cases of fracture of the astragalus. These showed: Good result, 2, or 25 per cent.; bad result, 6, or 75 per cent.

From such a small series it did not seem possible to determine what type of fracture was the most favorable. It did, however, appear that cases with a fracture of the neck did not

always give bad results, and that the amount of displacement between the body and the neck was, as would be expected, the most important element in permanent disability. It is very obvious from the results that this fracture gives a result distinctly worse than fracture of the os calcis.

*Duration of Disability*—Since, at the present time, many of these cases become the subjects of litigation, it is important to inquire in regard to the duration of disability.

*Os Calcis* The duration of disability was known in twenty cases of fracture of the os calcis. Of these, 14 were disabled not in excess of six months, 1, from six months to a year, 3, from a year to a year and a half, 2, from a year and a-half to two years. The average duration of disability was somewhat in excess of six months.

*Astragalus* The duration of disability was known in nine cases of fracture of the astragalus. Of these, in 1 it was not in excess of six months, in 2 it lasted from six months to a year, in 2, from a year to a year and a half, in 1, from a year and a half to two years, in 3, over two years.

The average disability was about a year and a-half. From this it will be clearly seen that the duration of disability in fractures of the astragalus is much in excess of that in fractures of the os calcis, and the probable duration of disability will be an important factor in estimating the appropriate compensation for damage in these cases.

*Other Factors Influencing Prognosis*—In examining these cases we have been struck by the frequency with which marked thickening is found in the region of the external malleolus and by the fact that it is the point to which many of them refer most of their pain. Thus, out of eighteen cases of fracture of the os calcis, in which our notes are complete on this point, we find that in twelve there was marked thickening in the region of the external malleolus (see Fig. 15), and in only three was the thickening marked beneath the internal malleolus. Gaupp ascribes this thickening to the forcing of fragments outward, because the foot is more or less

inverted at the time of the injury. It seems to us more reasonable to suppose it to be due to the anatomical arrangement of the bones, by which the force, transmitted directly downward, will be somewhat broken on the inner side by the anatomical position of the neck of the astragalus and its tendency to give, whereas, upon the outer side the force is exerted directly upon the body of the astragalus and transmitted to the os calcis. It may also be suggested that the lower position of the external malleolus and the smaller size of the depression on the outer side of the ankle make the fragments thus placed a greater source of obstruction to motion. In many cases the arrangement of the thickening is such as to suggest that the tip of the external malleolus was practically embedded in new-formed bone, and that there was an attempt at the formation of a false joint in this position, with accompanying pressure and pain. In one case, at least, removal of the overgrowth of bone in this position produced marked improvement in the symptoms and the foot was transformed from a bad to a good result (Fig. 16). We believe that more attention should be paid to this point and that more frequent resort to surgical intervention after the disability is fully developed will result in considerable improvement in many cases.

*Compound Fractures.*—As might be expected, the cases of compound fracture show a long period of disability. Infection is common, and complicated, as it is, by the proximity of many joints, makes it proper to classify this injury as a very serious one. In not a few reported cases amputation has ultimately been necessary and in most cases repeated operation only has resulted in cure.

*Treatment.*—Treatment may be divided into that applicable to fresh cases, and a discussion of what may be done to remedy the disability caused by old fractures which have either been improperly treated or in which serious disability has resulted in spite of the best of care.

*Treatment of Fresh Cases*—The general principles of treatment do not essentially differ from those applicable to other fractures in this region. The foot should be elevated and during the stage of acute swelling can be put up in a pillow splint or posterior wire splint in such a way that the bandages can be readily removed, the condition of the soft parts inspected and ice bags applied if necessary. Where the skin is threatened by a loose fragment it must be carefully watched with a view to replacing or removing the fragment by operation before the vitality of the skin is too much lowered. After the swelling has considerably diminished—generally at the end of a week or ten days—an attempt may be made to improve the position if loose fragments are present. In impacted cases little but damage is likely to be done by manipulation unless undertaken as the result of indications clearly shown in the X ray plate and by methods to be discussed in detail later. Except for the retention in position of loose fragments and after operative interference there is little necessity for immobilization in these cases and the slavish adherence to this principle of the treatment of fractures is likely to increase rather than diminish the disability. In impacted cases early massage and passive motion are to be strongly advised though of course care must be taken to see that loosely impacted fragments are not disturbed. The most common and serious error in treatment is to allow the patient to bear his weight upon the foot too early. We are entirely in accord with the opinion expressed by Nasse and Borchardt<sup>6</sup> that these cases should bear no weight on the foot for at least sixty days. It is abundantly evident that the amount of callus in many cases is excessive and is an important cause of disability and it seems reasonable to suppose that the amount of callus will be considerably increased by early use of the foot. On the other hand massage and passive motion by tending to preserve free movement in all the joints and prevent unnecessary adhesions will have a marked effect in diminishing the disability. After the union is firm—that is after a lapse of about sixty days—the use of the Zander apparatus as a supplement to

passive motion is of undoubted benefit. There remain, however, a considerable number of special considerations, based upon a thorough understanding of the nature of the fracture, which will influence the surgeon in the treatment to be adopted, and which must be considered in detail.

#### FRACTURES OF THE ASTRAGALUS.

*Fractures of the neck.*—I. Cases in which the anterior fragment, consisting generally of the head and neck, is more or less dislocated and threatens the skin, require prompt treatment. It is occasionally possible to reduce the dislocated fragment and free the skin from dangerous pressure. Where this can be done it may be satisfactory, but in many cases the reduction will be only partial, sufficient, indeed, to relieve the immediate danger of the skin, but entirely insufficient to lead to a good after-result. Where reduction is possible they come into the class to be considered in the next heading. Where reduction cannot be achieved, or where the vitality of the skin has been seriously compromised, immediate operation is to be advised. This should consist in a free, curved incision over the front and outer side of the ankle joint, which will give good access to the fragments. The annular ligament should be divided and tendons retracted to an extent sufficient to give thoroughly good access. If the anterior fragment is sufficiently shattered and torn from its attachments to seriously compromise its vitality, a better result will probably be obtained by its complete removal than by an attempt to restore it to an approximately normal position. If, on the other hand, the principal fragment is large and its blood-supply probably good, it may be replaced in its proper position and held either by suture or wiring. The number of cases in which replacement with suture has been attempted is too small to warrant conclusions, and, though it is an ideal method of treatment, it is proper to admit that excellent results are obtained after complete removal of the head and neck of the bone, and that the danger of bone necrosis, with or without infection, is much less.

It is unnecessary to add that such an operation must be attempted only under the very best conditions and with the strictest attention to asepsis

2 *Fractures of the Neck with Rotation of the Posterior Fragment*—This class is quite similar to the one just considered, except that as the skin is not threatened there is no indication for immediate intervention, and operation should not be undertaken until the swelling has subsided and the tissues are in a better condition. Reference to the illustrations will show, better than any description, the reasons for operation in these cases (Fig 19). The results without operation are nearly uniformly bad. Great limitation of the ankle joint is the rule and is not likely to be exceeded by that resulting from operative failure. In short, it is hardly probable that the ultimate condition will be made worse, and there is the best reason for supposing that it will be greatly improved.

The end to be sought by operation is the restoration of the fragments to their previous position. The difficulty lies in the rather insufficient exposure by any incision at our command, and the difficulty of rotating the body or posterior fragment into a normal position and then holding it in contact with the anterior fragment. If this can be done in a reasonably satisfactory way it is to be preferred to the alternative of removing the anterior fragment but the latter procedure has given excellent results. The choice between these two operations can probably not be made until the joint is freely opened and the position and motility of the parts have been accurately determined. The importance of operation can be determined by a critical examination of the X-ray plate but not the exact operation which will give the best results.

3 *Fractures of the Body*—Fractures of the body of the astragalus are commonly impacted and frequently complicated by impaction of the underlying portion of the os calcis (Fig 22). Though the ultimate result is likely to be bad, and much loss of motion at the ankle joint frequently results, it does not



appear that operation is likely to improve the condition. In some cases, however, the fracture is not impacted, or, at least, is partially impacted, being complicated by loose fragments, particularly from the anterior portion of the body. These fragments are particularly likely to become fixed in such a position as to prevent dorsal flexion, and when such fragments exist their removal is indicated. It is, however, by no means easy to determine the looseness of such fragments, or, indeed, to definitely state their origin. In one of our cases a fragment lying in front of the body of the astragalus was removed, and was thought to have come from that bone, but a study of plates leaves us in considerable doubt as to its origin.

#### OS CALCIS.

##### 1. *Small Loose Heel Fragments (the Avulsion Fracture).*

—These cases, which may be typified by Fig. 6, are best treated by operation. If left to nature, the convalescence is slow and a troublesome prominence over the heel is practically certain to result. The fragment is readily exposed by a curved incision and may be held in position by a nail or by suture or wiring, as suggested by Eisendrath.<sup>6</sup> The simplicity of the operation and the practical certainty of a good result, if skilfully carried out, seem to make the indication clear.

*Large Heel Fragments.*—These cases open an interesting field for discussion of possible benefit which may result from active treatment. When treated expectantly the results are frequently far from satisfactory. The upward displacement of the heel fragment generally results in troublesome "flat foot," and it is certainly possible that the condition may be improved by an attempt to improve the position. Carless<sup>7</sup> has suggested the possibility of pulling down the fragment into its proper position, or even over-correcting the deformity after division of the tendo Achillis. We have ourselves in one case done this without knowledge of previous work, and the result has been sufficiently favorable to encourage us to make a

further attempt in this direction. In this instance, after subcutaneous tenotomy of the tendo Achillis, a large posterior fragment, which was partially impacted, was loosened, though with some difficulty, and its position apparently improved. The ultimate result has been considerably better than in most of the similar cases which we have seen. The difficulty in improving the position in this case came from inability to get a firm grip upon the heel fragment. This could be readily done by drilling two small holes on the sides of the heel fragment and inserting powerful hooks such as those used by Porter,<sup>8</sup> in elevating the head of the bone after fracture and dislocation of the head of the humerus. With this addition to the technic there seems to be no doubt that the fragment could be broken loose from its impaction and placed in an improved position. It would probably be wise to over correct the deformity and make the arch of exaggerated height on account of the tendency of these fragments to work upward as the swelling goes down beneath the plaster. A snugly fitting plaster of paris dressing seems the most appropriate method of retaining position in these cases. While our experience is entirely too limited to warrant the assertion that such a method is to be unhesitatingly advised we feel that further research in this direction is much to be desired.

2 *Fissures—Comminution of the Anterior Half—Complete Comminution*—In the treatment of fresh cases of these varieties it does not appear that anything but expectant treatment is justifiable. In case of fissure a good result is generally to be had by this method. In comminutions of the anterior half the resulting disability comes from flattening of the arch and from the lateral displacement of fragments, particularly to the outer side, which interfere with the lateral motions of the foot and cause pain. It is possible to improve somewhat the flattening of the arch by padding under a plaster bandage, and this should always be attempted. In the early stages it is impossible to estimate how much trouble the lateral fragments will cause, and active intervention is therefore best postponed.

until union has taken place and any indication for interference can be more accurately mapped out. In the case of complete comminution the same reasons make it unwise to interfere, except for the relief of resulting disability.

*Old Cases.*—The surgeon is frequently called upon to decide what can be done to improve the results of old fractures, either of the astragalus or os calcis, which have either been wrongly diagnosed, improperly treated—particularly by too early use—or which have followed the most conscientious treatment. The chief complaints are of limitation of motion, pain, or faulty positions of the foot, with displacement of the normal weight-bearing line. Many of these cases can be improved, and we are inclined to feel that the tendency has been to over-conservatism, and that greater willingness to attempt operative relief will be followed by good results.

*Old Fractures of the Astragalus.*—In these cases there are two prominent indications for operation:

(1) Limitation of motion: This frequently follows fracture of the neck of the astragalus with faulty union, as shown in Fig. 20. Motion is likely to be very much limited, and may be practically nil. The two operations to be considered are partial, or complete, astragalectomy. In the partial operation only the head and neck of the bone are removed, and this is particularly applicable to cases of faulty union due to rotation of the posterior fragment. The resulting improvement in motion in these cases has been very encouraging. Where the disability is great, and removal of the anterior fragment does not relieve the condition (a situation particularly likely to occur where the body of the bone has been broken), complete astragalectomy should be seriously considered. The possibility of a worse result is not large and very great improvement has followed in some of the cases in which this has been done.

2. Cases of Valgus or Varus Deformity: Cases of fracture of the astragalus are particularly liable to the worst varieties of

pronated "flat foot" This is well illustrated by the case shown in Fig 23 In this case, as in other similar ones, the amount of motion at the ankle joint was sufficiently good to make it improbable that it could be improved by operation On the other hand, very great disability resulted from the position of the foot, and operation was indicated for the same reasons that it is to be advised in severe cases of rigid "flat foot" The operation most applicable is the osteotomy of Trendelenburg<sup>9</sup> in which the tibia is divided with an osteotome from side to side just above its articular surface, the chisel being manipulated so as to leave a V shaped gap The fibula is then divided at a similar level and the whole foot carried inward until the weight bearing line is normal The operation has been frequently done by the orthopedic surgeons for "flat foot" and with excellent results but it is important not to over correct the deformity as there is little or no tendency of the bones to return to their former position, and it is entirely possible to convert a valgus into a varus foot by over correction Extended discussion of this point does not seem necessary, as the problem is essentially that of "flat foot"

*Fractures of the Os Calcis*—These fractures do not present an attractive field for late operative interference. In those cases, however, in which there is excessive callus formation below the external malleolus, resulting in a painful foot, considerable relief may be expected Whether this pain is due to pressure upon nerve filaments or simply to pressure of the lower end of the fibula against the new formed bone, we are unable to decide, but the indication for the removal of such offending masses of bone seems to us clear, though it cannot be expected to influence to any great extent, the motions of the foot In many of these cases, however, pain rather than limitation of motion is the cause of disability, and where this is the case operation is practically certain to result in improvement

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FIG. 1.—Fracture of the os calcis. This illustration shows well the amount of local swelling, the extent to which it is confined to the foot, and the lack of obvious deformity.

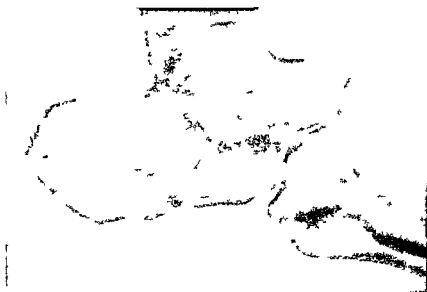


FIG. 2. Fracture of the os calcis. Man 40 years, fell ten feet striking squarely upon both heels on the ground.

X ray shows fracture of the os calcis of the large heel fragment type.

This is a favorable case for tenotomy of the tendo Achillis and reduction of the posterior fragment with restoration of the arch.

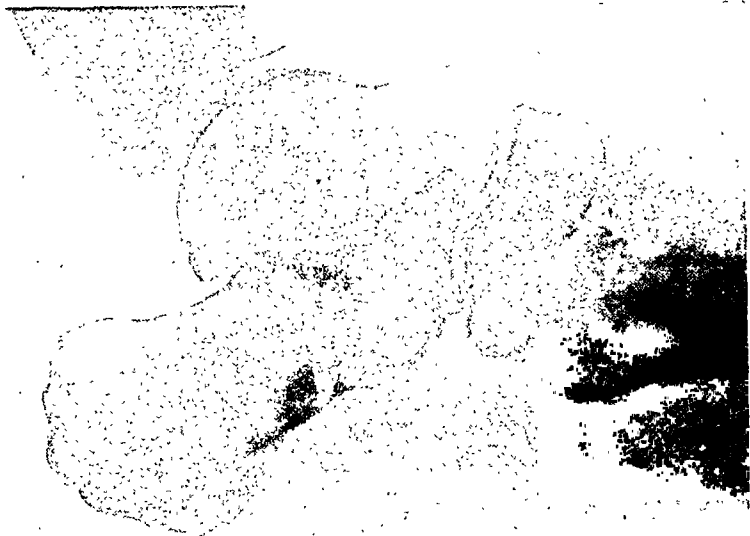


FIG. 3.—Fracture of the os calcis. This patient, a man, fell 15 feet on to frozen ground, striking upon both feet, in February, 1899. Right heel showed abnormal mobility and crepitus over the os calcis. X-ray shows comminuted fracture with large heel fragment. Treated with pillow splint; later, plaster of Paris bandage.

May, 1895. Has some pain through ankle joint. Always wears an insole. Is considerably hindered about his work. Examination, right foot: Considerable bony overgrowth beneath external malleolus. Motions: No flexion beyond right angle. No adduction. Very little abduction. Fair extension. Good position. Longitudinal arch, fair. Classed as fair result.



FIG 4 —Fracture of the os calcis. Man 26 fell from moving car striking left foot against tie. In May 1899 X ray shows fracture of os calcis large heel fragment type, with tendency of posterior fragment to be drawn upward. Plaster of Paris bandage.

June 1905 —Reports returned to work after three and a half months. Very little trouble at any time. Foot becomes tired after long days work. Present condition slight fulness beneath external malleolus. Extension good. Flexion slightly limited. Very little lateral motion. No flat foot. Classified as good result.



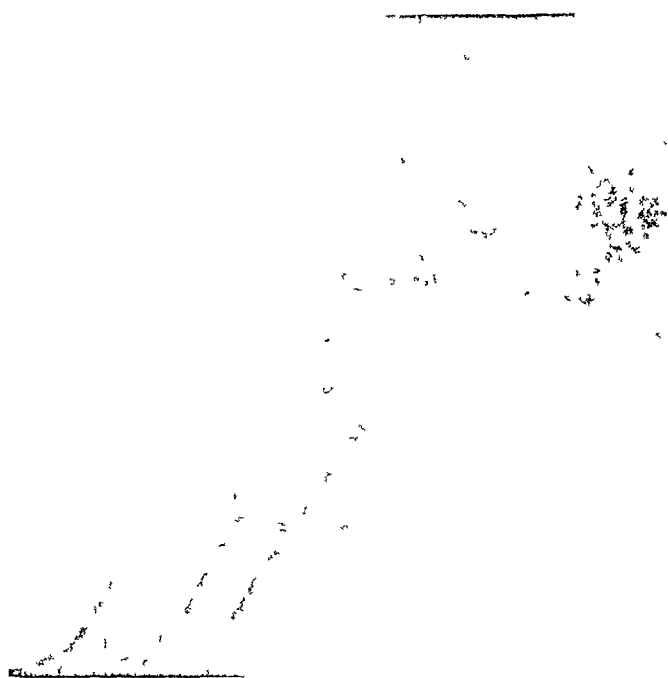


FIG 5—Fracture of the os calcis. Shows same foot as Fig. 4, six years after injury. Note great thickening of central portion of os calcis with fusion of astragalo-calcaneal joint.



FIG. 6.—Fracture of the os calcis. A beautiful example of small heel fragment type of fracture—the avulsions fracture of other authors.

Fracture caused by slipping while getting on a street car apparently by sudden contraction of muscles of calf. Operation refused. Result unknown.



FIG. 7—Fracture of the os calcis (left) Man, 44 fell ten feet to the ground, striking on both feet

November, 1899 X ray shows fracture of both ossa calcis of fissure type. Treated, plaster of Paris bandage

May, 1905 Reports returned to work after six months At first considerable pain in walking, now only in bad weather Some soreness under instep, troublesome when climbing ladder Examination of left foot showed practically no adduction or abduction Flexion and extension good Foot very flat and slightly pronated Classified as fair result

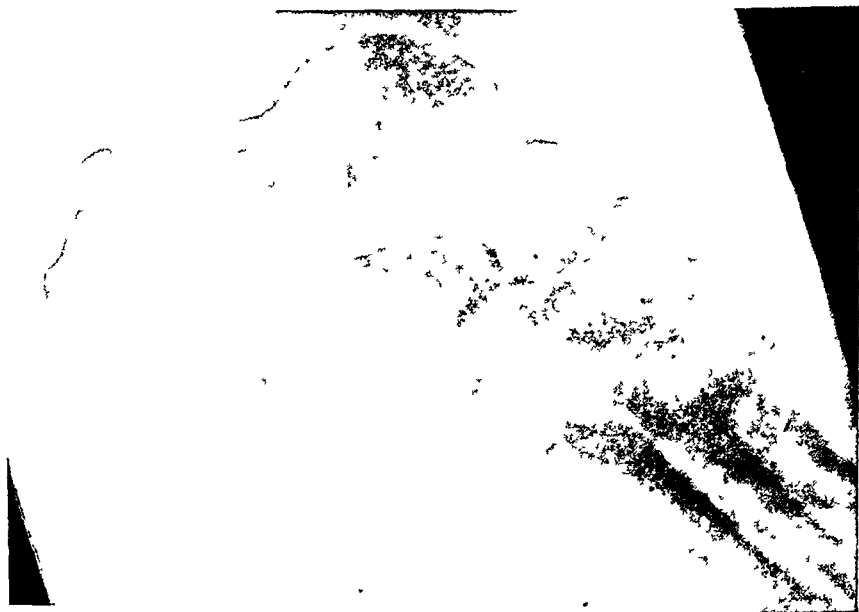


FIG. 8—Fracture of the os calcis X-ray shows right foot of patient whose left foot is illustrated in Fig 7 Examination, May, 1905, showed some irregular thickening in front and below malleoli All motions free Considerable "flat foot" Weight-bearing line normal.

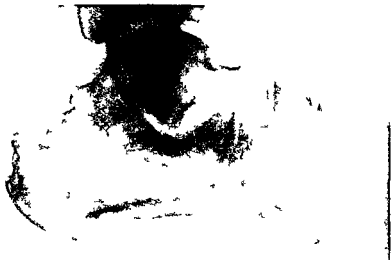


FIG 9--Fracture of the os calcis. Shows condition of right foot of patient described under FIG 7 5 years after injury. Note practical return to normal. Classified as good result.



FIG 10--Fracture of the os calcis. Shows type of fracture described as comminuted on anterior half of os calcis. Result unknown.



FIG 11 —Fracture of the os calcis Shows another type of comminuted fracture of the anterior half of the os calcis Note great flattening of longitudinal arch Result unknown



FIG 12—Fracture of the os calcis (right)



FIG 13 Fracture of os calcis (left) Figs 12 and 13 show the injury resulting to a man of 26 who fell thirty feet to the ground striking upon both feet. On the right side the injury was compound. They represent the worst type of comminuted fracture of the os calcis. Classified as completely comminuted injury too recent to show result.

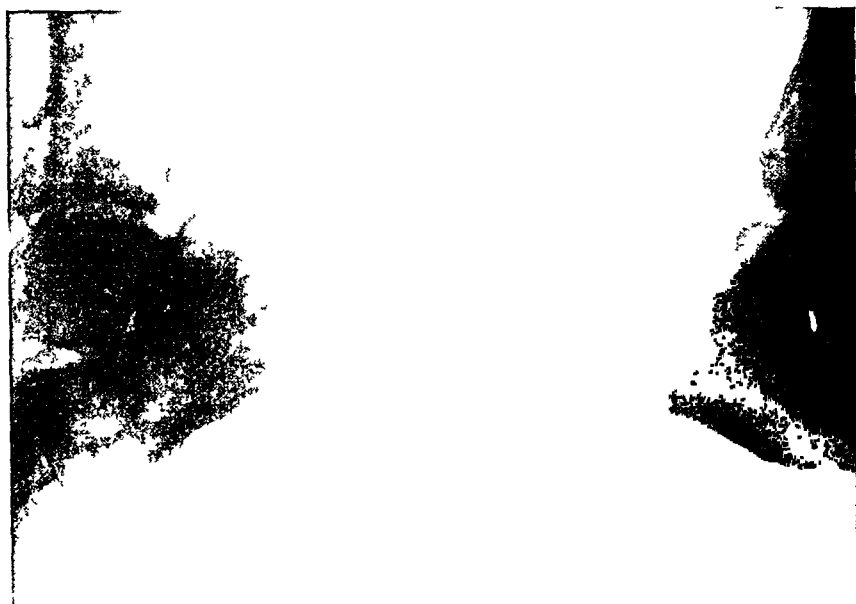


FIG 14 —Fracture of both ossa calcis (lateral view)

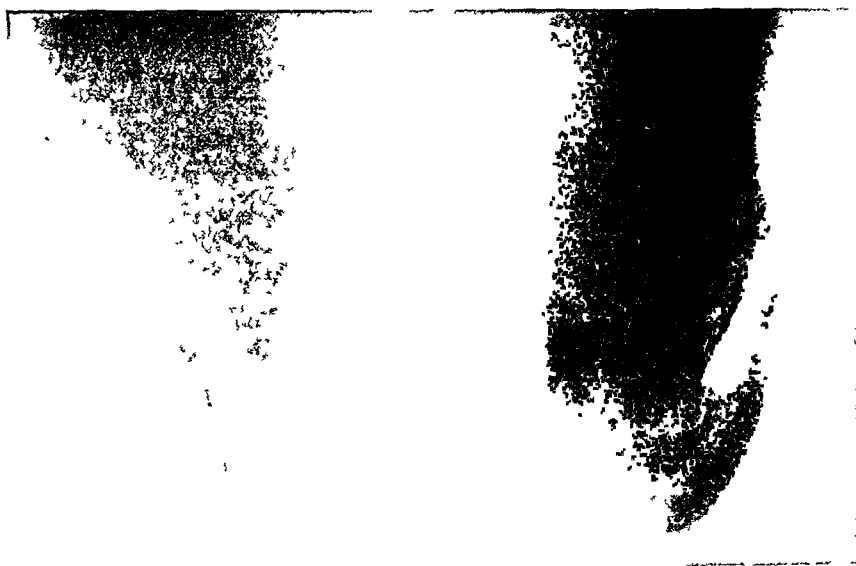


FIG 15 —Fracture of ossa calcis (Seen from above downward) Figs 14 and 15 show the condition six years after injury from fall of twenty feet on to concrete floor In May, 1905, left foot shows much thickening below external malleolus Longitudinal arch obliterated Rigid pronated foot Bad result Right foot Marked thickening to outer side of tendo Achillis All motions good 'Very little flat foot' Good result



FIG 16 Fracture of os calcis. The astragalus here dives down into os calcis lowering ankle joint. Eight months after injury painful to touch thickening under external malleolus no lateral motion limited flexion and extension. Bad result. Operation by Dr Goldthwaite. Removal of bony overgrowth beneath external malleolus. Now useful foot.



FIG 17—Os trigonum. In cases of injury this is frequently mistaken for a chip from the astragalus.



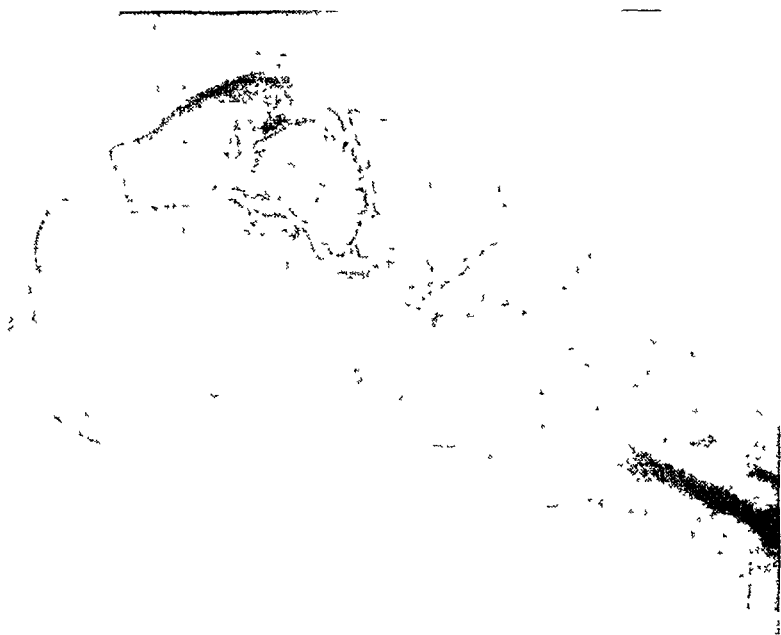


FIG 18—Fracture of the astragalus. Patient fell ten feet to ground, September, 1900. "Sprained ankle." X-ray, fracture of neck of right astragalus.

March, 1901. Bad result. Useless foot. Partial ankylosis. Partial astragalectomy, Dr. Brooks.

May, 1905 Foot slightly inverted, longitudinal arch raised, no lateral motion, no flexion, 10 degrees of extension. Painful foot Bad result.



FIG. 19.—Fracture of astragalus. Fracture due to direct violence from heavy bar falling on foot. May 1904. Plaster of Paris bandage.

July 4. Trendelenburg osteotomy. Carney Hospital.

May 1905. Painful foot. Forward displacement of foot on leg. Exaggerated longitudinal arch. Deformity not wholly corrected by operation. Marked inversion. Flexion good. Extension limited. Lateral motions limited. Bad result.



FIG 20 —Fracture of astragalus Foot run over by heavy team, February, 1902 Treated by natural bone setter X ray shows fracture of neck of astragalus Operation advised and refused

September, 1905 Painful foot. Much inversion, large bony fragment on dorsum (head of astragalus) Flexion fair Extension poor No lateral motion Foot very flat. Bad result.



FIG. 21.—Fracture of astragalus. X ray shows impact on of astragalus especially in central portion with lowering of ankle joint.



FIG. 22.—Fracture of astragalus. X-ray of right foot of patient shown in Figs. 23 and 24; impacted fracture of astragalus with lowering of ankle joint. Marked eversion.

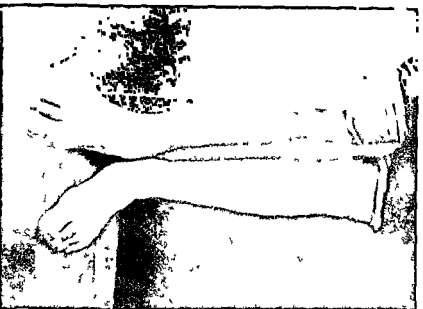


FIG. 23.—Fracture of pasternus. Note marked eversion with displacement of weight bearing line showing indications for Trendelenburg osteotomy.

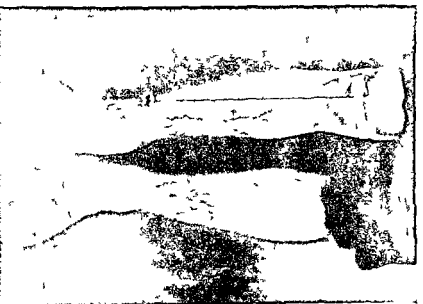


FIG. 24.—Same pastern after osteotomy. Weight bearing line partially restored. Foot corrected from a poor to a good result. Now walks with out discomfort or limp.



## OLD FRACTURE OF THE TARSUS.

WITH A REPORT OF SEVENTEEN CASES \*

BY LEONARD W ELY, M D,  
OF NEW YORK

IN many cases of fracture of the astragalus or of the calcaneum the nature of the lesion is apparently not recognized at the time of its occurrence. Many of the patients are treated for sprain or contusion, or for fracture of the malleoli. Later their condition is often thought to be due to rheumatism.

### REVIEW OF CASES OF FRACTURE OF THE CALCANEUM AND OF THE ASTRAGALUS

Hippocrates described tear fracture of the calcaneum, and said that, when improperly treated, it often resulted in gangrene. Theodoricus, in 1546, and others following him, denied that the calcaneum was ever fractured. "*Calcaneus non fragitur, quia os durum est et protectum ligamentis*" "*Nullo pacto calcis accidit fractura*" Norris, in 1839, published the results of an autopsy on a patient who had fractured the anterior processes of both his calcanea by jumping in delirium from a third story window. Malgaigne, however, seems to have been the first to describe accurately this form of fracture by crushing force giving it the name of "*fracture par écrasement*" Abel, reporting in 1878 three cases of fracture of the sustentaculum tali by direct violence, was surprised to find that he was almost a pioneer in the subject. Fractures of the anterior part of the bone are hidden from sight and from touch. This, he thinks, is the reason why they have for centuries passed unnoticed, while tear fractures of the posterior part have been recognized.

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\*Read at the annual meeting of the American Orthopædic Association Toronto August 21, 1906



Since 1878 many cases of fracture of the astragalus and of the calcaneum have been reported, so many, indeed, that, unlike Abel, one is surprised at the great number of workers in the field. A study of the views of various writers lets in the light on what has been an obscure subject, and seems to point the way to a more successful treatment of these injuries.

Norris<sup>1</sup> reports a case of a man of thirty-five, who jumped from a window while drunk. Gangrene followed, and death. The autopsy revealed "fracture of the calcaneum in two places in its anterior part." There was no displacement. The author says that it was remarkable that the most certain diagnostic sign of this accident, the drawing up of the posterior fragment by the tendo Achillis, was absent.

Abel<sup>2</sup> appears to have been the first to recognize the importance and frequency of crush fractures of the calcaneum, and reports three cases of fracture of the sustentaculum tali, one being compound. This last case went to autopsy. Abel gives three symptoms as characteristic: First, broadening of the heel, Second, flattening of the foot and sinking of the malleoli, especially of the inner. This is due to the fact that the breaking off of the sustentaculum tali deprives the foot of its support on the inner side. Third, immediate pain and disability. Usually the disability is so great that the patient is unable to walk a step. If in an ordinary crush fracture the fragments are much impacted, the immediate disability is not so great. The author says that most of these fractures are treated for fracture of the leg bones, or for sprains.

Bailey's<sup>3</sup> case of fracture of the calcaneum is more or less doubtful. The patient, a farmer of forty years, had his foot caught between the table of a threshing machine and a wagon. From the description of the case one suspects fracture of the astragalus. The treatment consisted of rest on a pillow, with no splint. One year after the injury motion was limited at the ankle.

Goyder's<sup>4</sup> case was a compound comminuted fracture of the astragalus, with protrusion of the external malleolus. The foot was in inversion. Through the wound the author removed the astragalus, which had been broken into numerous fragments. The foot was put up in splints and the patient recovered with a movable ankle and a useful foot. Four and one-half years afterward the foot was shorter and narrower than the other. The patient could not bear his whole weight upon the front part of it, and, in walking, planted it squarely on the ground.

Bell<sup>5</sup> reports two cases of compound fracture of the calcaneum both caused by a fall on the feet. Nothing is said as to the amount of resulting disability, nor of the symptoms. In one case, "the bone was completely pulverized."

Van Buren<sup>6</sup> presented a specimen of a calcaneum which had been excised for caries following a comminuted fracture of the anterior portion,

several weeks before. The patient had been blown up by a blast, and landed squarely on his feet when he descended. Several months later the patient was about on crutches. This was the last note on the case.

Stimson<sup>7</sup> showed a specimen of an old fracture of the calcaneum. The injury had taken place eight years before, probably as the result of muscular action, and the bone had united in a bad position.

Whitman<sup>8</sup> reports a case of a double fracture of the calcaneum, compound on the right side, which was caused by a fall of eighteen feet. Death followed on the twelfth day from pulmonary embolism. The autopsy showed the following "Fracture of inner aspect of right os calcis immediately below the articulation with the astragalus" (*sustentaculum tali*?). Left side, "Os calcis completely smashed. The superior surface firmly impacted into the surface to which the tendo Achillis is attached. This portion of the bone was also fractured in various directions. The remainder of the bone was broken into several fragments."

Bishop<sup>9</sup> published a case of a painter, thirty-four years old who jumped from a ladder to the ground as the ladder slipped a distance of thirty-six feet, and fractured his astragalus, external malleolus and cuboid. The foot was in inversion, and seemed shortened on its inner border. Part of the astragalus was dislocated on the outer side of the dorsum of the foot. The deformity was reduced under chloroform. On the eighteenth day the patient died of pneumonia. The autopsy showed the following "The astragalus was divided into two main portions by a fracture which passed obliquely backwards and inwards, and from above downwards and forwards, along the line of the interosseous ligament, which was utterly destroyed." Part of the external lateral ligament had been torn, as well as some of the other ligaments of the foot.

Humphry's<sup>10</sup> patient was a boy of sixteen years, who fell sixteen feet on his left foot, and fractured his astragalus. A portion of the astragalus was dislocated and could be felt beneath the skin "on the left side of the dorsum." This was reduced under chloroform with difficulty and the foot was put up in splints. After two weeks the dislocation gradually returned and caused a small slough of the skin. Chloroform was again administered, the wound was enlarged, and the displaced fragment was removed. The fragment consisted of one half of the astragalus which had been separated by a longitudinal fracture transversing the middle of the bone. Humphry does not say what was the end result.

Gussenbauer<sup>11</sup> reported a tear fracture of the calcaneum. He says that fractures from this cause are very rare. He nailed the fragment on to the body of the bone, and secured a good result.

Stimson<sup>12</sup> in 1888 gave the results of autopsy on a case of fracture of the os calcis and scaphoid. The patient was an adult male of thirty years who jumped in delirium tremens from a height of thirty feet.

Gilchreest<sup>13</sup> in the same year, reported two cases, one of fracture of the calcaneum from crushing between freight cars, one of fracture of the internal cuneiform. Both fractures were compound and were operated upon with good results.

Beeson<sup>14</sup> described three cases of compound fracture of the astragalus, two caused by a fall on the feet, one by a blow from a mass of iron. In all three the bone was broken into a number of pieces. Beeson removed the fragments and treated the wound by drainage. The first two cases ended in amputation. The third was under treatment at the time the report was made, but looked as if it would end in the same way.

Reed<sup>15</sup> gives the history of four cases of fracture of the astragalus with displaced fragments, which were treated conservatively. In three of the cases the results were bad, in one, good. In all, the injury had been produced by a fall on the foot.

Betts<sup>16</sup> showed a photograph of a calcaneum which he had removed from a painter. The patient had fallen about fifteen feet and landed on his feet on a stone sidewalk. He was treated for ten days under a diagnosis of sprained ankle. At the end of that time, when Betts first saw him, the foot had become infected. Final amputation was done to save the patient's life. Although the photograph is not very distinct, the case would appear from the author's description to be an impacted fracture.

Bähr<sup>17</sup> described ten cases of compression fracture of the calcaneum, all with the same cause, a fall from a height. The diagnosis, of course, was without the X-ray. Bähr says that the characteristic symptoms of recent fracture are (1) swelling under the ankle; (2) sensitiveness over the calcaneum; (3) restriction of motion at mid-tarsal joint; (4) great pain on walking, usually located under the external malleolus and anterior to it; (5) slow recovery. The motions of flexion and extension at the ankle are free, but supination and pronation, and abduction and adduction are painful and restricted. The foot may or may not be flattened; the calcaneum may or may not be thickened and the malleoli sunk, depending upon the amount of crushing. The author considers that the fractures of the sustentaculum tali reported by Abel are rarities. The part of bone broken depends upon the position that the foot is in. Bähr advocates, in closed fractures, plaster of Paris left on for a long time. He thinks walking should not be allowed for two months. It is a mistake to put the weight of the body on the crushed, soft bone. Afterwards, massage and active and passive motion may be tried. All stiff parts are useless and painful. Bähr thinks the flat foot is of little moment. The pain is due to the weight of the body upon the distorted bone, often not fully hardened, and is especially severe where a sprain has been diagnosed, and the patient urged to walk early. Prognosis as to complete recovery is bad. Bähr reaches three conclusions: First, fractures of the calcaneum are more frequent than has been thought. Second, they are usually unrecognized and are treated as sprains, fractures of the malleoli, etc. Third, they usually cause a prolonged disability, often of a severe grade.

Bähr<sup>18</sup> also reported a case of old fracture of the right calcaneum. Operation was done on account of a painful swelling in the heel which was diagnosed as a bunion. A piece of bone was chiselled off, with good results.

Jones<sup>19</sup> described an old fracture of the astragalus and calcaneum

in a patient who had fallen from a height of thirty feet, landing on his feet. The injury was followed by immediate pain. The diagnosis had been sprain of the ankle.

Ehret<sup>20</sup> in a paper published in 1896, states that of the 2016 patients treated at his institute, 47, or 2½ per cent, had fracture of the calcaneum. Of these 47 only three came with the correct diagnosis. Thirty were of the left foot, thirteen of the right, and four of both. When the right alone was broken, the injury was distinctly of that foot. When the fall was upon both feet, the right was never broken alone, but the left was broken, or both. The stubbornness of the symptoms is marked. Only five patients were discharged completely well, and these were young. The cause is a direct blow or a fall on the feet, usually the latter. The fracture is always caused by an involuntary jump or fall, never when the patient jumps down naturally, for then he probably catches a large part of his weight on the front of his sole. The fall was always from a height, never a fall over on the level. There is no relation between the height of fall and the intensity of the fracture. Ehret has never seen a pure tear fracture, though he thinks the pulling of the muscles, fasciæ, and ligaments, plays a strong part in the crush fractures. He divides all fractures into those of the body and those of the processes. Immediate disability is not invariable. Dorsal and plantar flexion may not be limited. Abduction and adduction, and pronation and supination almost always are limited, because these motions take place between the calcaneum and the astragalus, scaphoid, and cuboid. The gait is characteristic, the foot being held immovable. The patient walks always on the same part of the sole. Ehret did not notice that the patient walks on inner border, but thinks he often walks on outer. The swelling is mostly about ankles and dorsum. There is thickening about the heels and filling in at the sides of the tendo Achillis. The author lays special weight on palpation. The outer side of the bone suffers most of the crushing, because the foot on the inner side can give way, whereas on the outer side it is rigid. When the body is weighted the inner ankle sinks (Sourier and Abel). Hence after fracture the external malleolus is nearer the ground. If both sink, the outer sinks more. The foot is always flattened because one of the most important stones of the arch is injured, and yet it is supinated. More than one half of the author's patients were flat footed before the injury. Foot clonus is present in about one-half of the cases. Calf cramps are frequent at night, and atrophy of the calf takes place. The diagnosis is made on five points. First, cause usually fall on sole. Second, restriction of abduction and adduction, with peculiar gait. Third, change in the contour of the heel. Fourth, broadening of the heel. Fifth, flattening of the foot. The patient must not be permitted to walk too soon, for fear of injuring the bone further. Massage, electricity, baths, gymnastics, and shoes are recommended. The restriction of supination and pronation causes most of the resulting disability. By operation any loose pieces of bone can be removed, as also the retro-Achilles bursa.

Joy<sup>21</sup> reported a tear fracture of the calcaneum plus comminution,

received by an intentional fall on the feet. Open operation with tenotomy was performed, but nothing is stated as to the end result.

Golebiewski<sup>22</sup> described a case of fracture of the scaphoid, astragalus, and calcaneum, caused by the attempt of a hod-carrier to go up a ladder in his bare feet with a heavy weight on his shoulder. In this case the diagnosis was probably wrong, as no fracture of the calcaneum appears in the skiagram. Palliative treatment attained a fair result.

Neuschäfer<sup>23</sup> published a case of pure tear fracture of a large piece of the calcaneum. Tenotomy did not avail to reduce the dislocated fragment. An incision was then made over the heel, and the fragment was sewn in place. The foot was put up in plaster, in strong equinus, and union was uneventful. Three and one-half months later the patient walked without a stick.

Vollbrecht<sup>24</sup> reported two cases of fracture of the astragalus. The patients were adult males. One sustained his injury by a fall from a horse; the other by a kick from a horse. One had been diagnosed sprain, and the other contusion.

Carless and Mayon<sup>25</sup> find that many of these cases of fracture of the calcaneum do badly if left to themselves. The resulting pain is due to depression of the astragalus and to formation of a large mass of callus under the calcaneum. Treatment is "somewhat unsatisfactory." In the early stages evaporating lotions are recommended. If, after swelling has subsided, the foot is in a bad posture it should be twisted back under an anæsthetic, and plaster of Paris should be applied. In an old standing case with much deformity and pain a wedge of bone may be removed, or the head of the astragalus may be excised, or even the entire astragalus.

Raven<sup>26</sup> reported a case of fracture of the astragalus and possibly also of the calcaneum (compare with Urban's<sup>35</sup> case). The patient was a male, aged seventeen, a waiter, who had fallen ten feet, landing on his left heel. Great swelling of the left foot and ankle were present. The foot was displaced inward and was inverted. There was crepitus below the internal malleolus, and a small bony movable mass could be felt. In a few hours all physical signs were obscured by the swelling. After a week's rest the deformity was partly reduced under anæsthetic, and plaster of Paris was applied. Eight weeks later the patient had a fair amount of motion and could walk fairly well. The foot still remained much thickened.

Vegas<sup>27</sup> published a case of fracture of the astragalus in a boy of twelve who was thrown from a horse, and had been in plaster of Paris for forty days before Vegas saw him. The foot was inverted, and motion at the ankle was restricted. Excision of the astragalus gave a good result. The writer maintained that these fractures were rare.

Bennett<sup>28</sup> describes a case of fracture of the astragalus, which he thinks was probably caused by a blow. The specimen was obtained from the dissecting room and was without history. There was a single line of fracture without displacement, which had united.

Villard<sup>29</sup> gave the result of an excision in a case of old fracture of

the astragalus. His patient walked without fatigue or limp and the equilibrium of his foot was perfect.

Galavielle's<sup>30</sup> case of fracture of the astragalus was evidently a linear fracture without much displacement. The patient was thrown to the ground and could not rise. There was great immediate disability. One year after the injury, flexion, extension, and lateral movements were limited. The author says that fracture of the astragalus is frequent, and is caused by direct or indirect violence. Usually it is not accompanied by displacement, and heals early and rapidly.

Heger<sup>31</sup> described three cases of fracture of the calcaneum, one a tear fracture, two crush fractures. The treatment of crush fracture recommended is by plaster of Paris. Union is hard to obtain.

Destot<sup>32</sup> reports three cases of fracture of the calcaneum, two of them recent, and two cases of fracture of the inferior extremity of the tibia and of the astragalus. All were caused by falls on the feet from a height of two to five meters. In only one case of fracture of the calcaneum was the bone badly splintered, and in this case the prognosis was better than in the others. In one case there was very little deformity and the foot was not flattened. The two fractures of the astragalus were almost exactly alike, one being two and the other twenty months old. In both the foot was in varus, and the tibio tarsal joint was ankylosed. A piece of bone four cm long was torn from the anterior aspect of the tibia and the foot was subluxated forward, giving it an elongated appearance. The hollows behind the malleoli were effaced, and those below the malleoli were partly so. Both patients had a permanent deformity which would diminish in time but at the end of twenty months one patient walked with difficulty and used a cane. He was incapacitated for work. Resection of the astragalus was the only remedy to be advised for these patients.

Destot<sup>33</sup> also reported a case of old fracture of the astragalus in a man of thirty five years, who fell about three feet, and was for five months treated for sprain. During this time the patient's condition had not improved. The author inclined to resection but the patient would not permit it. The prognosis of these fractures of the astragalus differs according to the location of the fracture and the displacement of the fragments. They are all apt to be very tedious. If one articular surface of the bone is involved, the prognosis is worse than if both are. Destot propounds the question whether it would not be better in fracture of the astragalus, realizing the tediousness and long duration of the symptoms to do an excision at the time of injury, rather than to wait for a year or two and then probably be obliged to do the operation.

Morgan<sup>34</sup> published a case of fracture of the astragalus with displacement of the posterior half, caused by a severe blow upon the thigh while the knee was flexed. Nothing as to treatment or result was given.

Urban's<sup>35</sup> case of fracture of the astragalus with dislocation backward of the posterior half, was in a glazier of fifty years of age, who fell from a height of twenty feet. The posterior part of the bone was dislocated. The tibia was forced through the fragments and rested on the

calcaneum. No exterior wound was present. The fragments could not be replaced even under an anæsthetic. Urban therefore laid bare the ankle by an incision on the inner side, divided the three tendons on the inner side of the foot, chiselled off the lower part of the inner malleolus, turned it down with the deltoid ligament, and brought the fragments of the astragalus into position. The tendons were then sewn, the malleolus brought into its proper place, the wound was closed, and plaster of Paris was applied. The results were excellent, the patient walking without the plaster in the sixth week. Urban says that with dislocation or fracture of the astragalus, the bone or fragment must be put in its proper place even if an extensive operation be necessary. The removal of the astragalus should rarely be done.

Neuhaus<sup>36</sup> reported eleven fractures of the calcaneum, ten apparently from fall on the feet, one a gun-shot fracture. The prognosis depends on the amount of damage to the bone. If the bone is badly crushed and the fragments are dislocated, the prognosis is bad; otherwise it is good. For treatment he recommends baths, massage, and exercise.

In Berard's case<sup>37</sup> of old fracture of the internal malleolus, etc., the injury had been caused by the fall of a heavy weight on the foot fifteen years previously. The patient had gone to work ten days later and but little deformity was then present. Two years afterward an abscess appeared at the site of the old wound. The description of this case leads one to doubt the correctness of the diagnosis. The bones of the tarsus were united in a solid mass, their outlines were lost, and they were hypertrophied and deformed. Rarifying osteitis was present in the posterior tarsal bones. The bone disease was accompanied by ulceration of the skin, club foot, ascending neuritis of the post-tibial nerve, and by severe trophic disturbance. The author himself seems uncertain as to the correctness of his diagnosis. The treatment was amputation!

Bouchet<sup>38</sup> reports a case of crush fracture of the calcanea with the classical symptoms. The patient fell from the third story, landing on his feet. Under chloroform an unsuccessful attempt was made to replace the fragments. The author recommends lateral pressure under anæsthesia to reduce the fractures. He considers that the symptoms following them are largely due to compression of the nerves and vessels under the bone.

Rollet<sup>39</sup> in 1904 published the report of a case of fracture of both calcanea. The patient was a mason, thirty-two years of age, who fell from the second floor, landing on his feet. The two ankles were said to have been forced into the bony masses which lapped over on the sides, and posteriorly the axes of the astragali were changed so that their heads, instead of looking forward and downward, looked forward and upward. The body of the astragalus was forced into the body of the calcaneum. The results were given as follows: First: the patient supports his weight on a heel composed of broken splinters of bone. Second: the mid-tarsal joint is opened up and is kept in a state of inflammation. Third: the arch of the foot is depressed.

Eisendrath<sup>40</sup> has recently published a case of tear fracture; the treatment consisted of suturing with kangaroo tendon.

In many of the above reviewed cases in which no X-ray photographs were taken, the diagnosis would seem to have been based upon conjecture and supposition rather than upon certainty

*Author's Cases*—Judging from the history of the author's cases, seventy-six per cent of them had been improperly diagnosed at the time of injury Fifteen of the patients were men, one was a woman, one, a boy of fifteen Six had a fracture of the left calcaneum, five of the right, one of both calcanea Three had a fracture of the right astragalus, one of the left One patient, the woman, had a fracture of both calcanea and of the left astragalus Two of the fractures of the astragalus, and one of those of the calcaneum, were associated with a fracture of the tibia

The history was the same in every case All the patients had fallen from a height, usually greater than ten feet They had been carried to their homes or to the hospital, and had been confined to their rooms from three to six weeks or more, those with fracture of the astragalus being disabled usually for a somewhat longer time than those with fracture of the calcaneum In three other cases, which presented some of the symptoms of tarsal fracture, and which were at first regarded as possible cases, the usual history of a fall from a height, with extreme immediate disability could not be obtained One was probably a case of syphilitic periosteitis one was a bruise, and the other was a severe sprain In Case II the patient gave a history of being struck by a barrel, only mentioning the fall on his feet when he was closely questioned Case V was treated at first with a wrong diagnosis This patient also admitted afterward the fall on his feet Numerous authors have taught that fracture of the calcaneum can be caused by muscular action and that the bones of the tarsus can be fractured by various kinds of direct violence, and they are undoubtedly correct But, on the other hand it may be said that if a man falls from a height and lands on his feet and if he is then unable to walk home and is confined to



his bed with great pain and swelling in his heels and in his ankles, a strong presumption, at least, of fracture of the calcaneum or of the astragalus is justified. If the patient be seen for the first time several months afterward and, besides giving the characteristic history, says also that he was confined to his bed for a month or two, and has since suffered from pain and stiffness in his heel or in his ankle; it is possible to tell almost with certainty, before he takes off his shoes, that he has a tarsal fracture. It is a great mistake to regard these fractures as rarities. They are, on the contrary, very frequent, and doubtless are responsible for much of the odium that attaches to a sprained ankle.

Cases VIII and XVII were seen at the Ruptured and Crippled Hospital; all the other cases at the Roosevelt Hospital, O. P. D.

*Case I.*—John Daly, aged fifteen, a schoolboy. Old fracture of left tibia and calcaneum. The patient fell about two months ago from a height of four stories, and landed on his feet. He was carried to the hospital and was confined there for six weeks. Examination shows old united fracture about two inches above the lower end of tibia, abduction of the heel, thickening about the calcaneum, and obliteration of the concavities under the malleoli. Treatment, strapping.

The X-ray shows probable fracture of sustentaculum tali.

*Case II.*—Thomas Breese, aged forty-nine, a carpenter. Old fracture of right calcaneum. Four months ago the patient "sprained" his right ankle by a fall on his feet from a height of twelve feet. He was carried in an ambulance to the hospital, and was confined there for three weeks. Since then he has suffered from pain and stiffness in his right foot. Examination shows the heel in peculiar abduction. The normal concavities under the malleoli are not present. The calcaneum is thickened.

The skiagram (Fig. 1) shows a probable fracture of the sustentaculum tali.

*Case III.*—Thomas Lacey, aged sixty years, a driver. Old fracture of the right calcaneum. Four weeks ago the patient jumped from a truck and hurt his right ankle. He reached

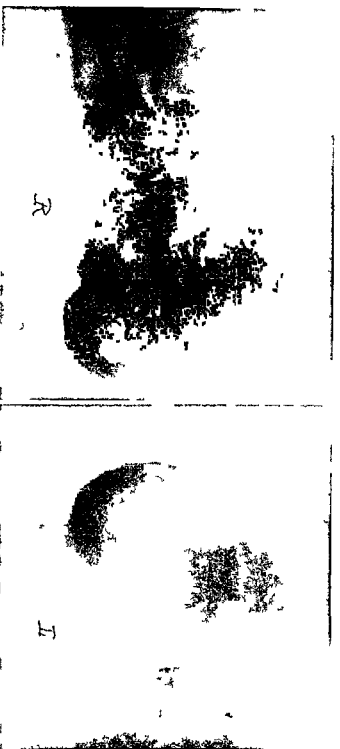


Fig. 1.—Old fracture of right calcaneum. See Case II. No nail bones of left tarsus shown for purpose of comparison.



FIG. 2.—Old fracture of right astragalus and calcaneum. See Case III Normal bones of left tarsus shown for purpose of comparison.

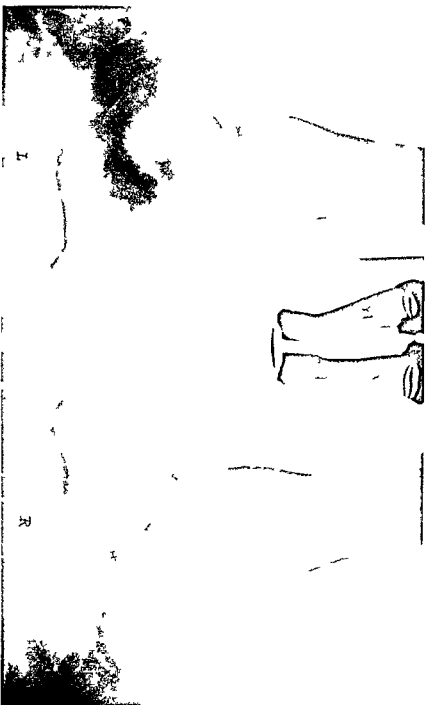




FIG. 4.—Old fracture of left calcaneum. See Case VII. Normal bones of right tarsus shown for purpose of comparison.

home with the aid of a broom for a crutch and was confined there for four weeks. Now he suffers pain under his external malleolus and about his heel when he walks. Examination shows peculiar abduction of the heel, disappearance of hollow under the external malleolus and thickening of calcaneum. Treatment: massage.

The X ray (Fig. 2) shows an old line of fracture of the calcaneum through the body of the bone.

*Case IV* —Whitfield Mabey, aged forty four years, a conductor. Old fracture of both calcanea. The patient was thrown off a freight car six months ago, landing on both heels. He was carried to the hospital and stayed there for thirty eight days, suffering great pain. He says that both heels were swollen and were black and blue. His injury was diagnosed sprained ankles. Since leaving the hospital the patient has been incapacitated for work. Examination shows both feet abducted, adduction painful, slight thickening is present about the heels.

The X ray (Fig. 3) shows fracture of both calcanea, probably of the sustentaculum tali.

Operation was advised and refused. The treatment consisted of strapping and shoes. Later the strapping was removed and the heels were massaged and were soaked in hot and cold water. A Whitman brace was applied on one foot. At last notice the patient was at work but was unable to pursue his former occupation.

Later Patient announces that he cannot work and has put in a claim for accident insurance on the ground of total disability.

*Case V* —William Donald, aged thirty seven years, a stone setter. Old fracture of right tibia and fibula and of left tibia and right calcaneum. Six weeks ago the patient's legs were squeezed in an elevator. The accident caused a compound fracture of both bones of the right leg and a simple fracture of the left leg. The patient was confined to the hospital for four weeks and had his plaster of Paris removed this morning. Examination: Union in good position of the fractures of the leg bones. Thickening under external malleolus of the right foot, peculiar abduction of the ankle, motion of the ankle free. Normal hollow absent under external malleolus. Internal malleolus prominent. Patient now admits having fallen three

stories three years ago, landing on right foot. He was in the hospital fourteen weeks after the fall.

X-ray shows smashing of the calcaneum, probably true impaction.

*Case VI.*—Joseph Kennedy, aged forty-two years, a laborer. Old fracture of left calcaneum. Three weeks ago patient fell from a height of twenty feet, and landed on his feet. He was carried home, and has been confined to the house ever since. He says he was "black and blue" under the ankles. Examination: Patient limps; his gait appears painful. Slight thickening is present under the external malleolus of the left foot, with extreme sensitiveness to pressure. There is no marked deformity. Treatment, strapping and massage. Under this treatment the patient improved somewhat.

The X-ray shows evidences of old fracture, little more than a slight irregularity of structure of the calcaneum.

*Case VII.*—Frank Duberstine, aged twenty-four, a clerk. Old fracture of the left calcaneum. Two and one-half months ago patient fell one story and landed on his feet. He was carried home and was confined to his house for five weeks. During this time he suffered pain in his left ankle. He complains now of pain and stiffness. Examination shows abduction of the heel and disappearance of the hollows under the malleoli, and a thickening most marked under the external malleolus.

Later, a Whitman brace was applied and was of some benefit.

The X-ray (Fig. 4) shows a fracture of the anterior process of the calcaneum, perhaps also a slight amount of impaction.

*Case VIII.*—Lewis Barken, aged twenty-four years, an operator. Old fracture of the right astragalus. Three years ago the patient fell down an elevator shaft, landing on his feet. He was carried to the hospital, and was there for four months, with a diagnosis of "fracture." He says his right foot was "twisted inward." The treatment was with plaster of Paris. Since then the heel has been painful and stiff. Removal of the astragalus was advised; but the patient refused his consent.

The X-ray (Fig. 5) shows great crushing of the astragalus in the posterior part, and fracture of the tibia.

*Case IX.*—Christopher Cheyne, a derrickman. Old fracture of right astragalus. Ten weeks ago the patient fell one story. He was taken home in an ambulance, and was confined to the

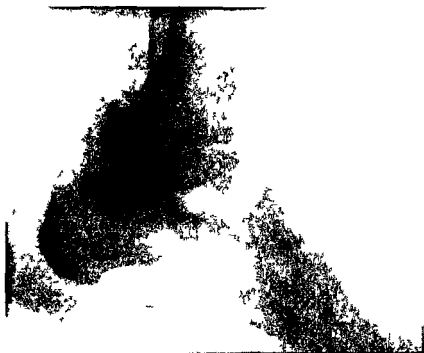


FIG. 5—Old fracture of right maxilla. See Case VIII





house for seven weeks with pain and swelling in his right heel. Since then he has suffered pain on walking. Examination shows thickening and stiffness about the ankle. Dorsal flexion is limited. There is no heel abduction nor obliteration of the normal concavities. Treatment, strapping.

The skiagram shows slight irregularity of the posterior part of the bone.

*Case X* —William Curran, aged fifty six years, a boatman. Old fracture of calcaneum. The patient fell in hold of boat five weeks ago, and landed on his left heel. He was in plaster of Paris for two weeks. "They claimed something was broke." Since then he has had pain and has limped. "Something was loose in heel." Examination shows thickening over the calcaneum. Treatment, strapping and shoes. On April 19, one month later, the patient had improved, but still suffered some pain. Hot and cold water was recommended. July 25 slow improvement, very little pain.

The skiagram shows a beautiful example of impaction of the calcaneum. The astragalus is also probable damaged in its posterior part.

*Case XI* —William Fried, aged twenty seven years, a machinist. Old fracture of left astragalus. Four months ago patient suffered a compound fracture of both bones of his left leg by being struck with a barrel. He was operated on in the Roosevelt Hospital. Examination shows a linear scar on the front of the shin, and another scar on the internal aspect of the leg, abduction of the foot, and thickening about the heel, and also limitation of abduction. The patient now says that he fell down stairs and that then the barrel fell down and struck him. The astragalus can be felt close up under the internal malleolus. Extension and flexion are limited at the ankle, they come to a sudden "bony" stop. Treatment, strapping and shoes. Two months later the foot was markedly improved, the patient was at work, and had good motion in his ankle.

The skiagram shows an old fracture of the body of the bone without much displacement.

*Case XII* —George White, aged thirty nine years, an ice-man. Old fracture of the left calcaneum. Patient says that he sprained his left ankle two months ago, and that since then he has suffered pain in it and has limped. The "sprain" was caused

by a fall from a height of ten feet. The patient landed on his feet when he fell. Examination shows thickening about the calcaneum, abduction of the heel, and disappearance of the hollows under the malleoli. Treatment, strapping.

The skiagram shows a slight change in contour of the calcaneum, probably a fracture of the sustentaculum tali.

*Case XIII.*—Edward Davey, aged forty-three years, a carpenter. Old fracture of right calcaneum. Three months ago patient fell a distance of fifteen feet and landed on his right foot. He was carried to the hospital and stayed there for over four weeks. His leg was encased in plaster for six weeks. The diagnosis seems to have been Pott's fracture. Since then the patient has suffered with pain and stiffness in his ankle. Examination shows the classical symptoms—thickening under the malleoli, obliteration of concavities, and abduction of the heels. Motion is not limited at the ankle. Treatment, strapping and shoes.

The X-ray shows fracture of the anterior process of the calcaneum, probably into several pieces.

*Case XIV.*—Patrick Lynch, aged thirty-six years, an electrician. Old fracture of the right calcaneum. Five months ago the patient fell about twenty feet, landing on his right heel. He was put up in plaster of Paris and went on crutches for five weeks. "They thought a bone was broken in the heel." Since then he has suffered from pain and has been disabled. Examination shows peculiar abduction of the right heel, filling out of hollows under malleoli, with thickening of the bone. Motion in the ankle joint is free. Treatment, strapping and shoes.

In the skiagram the sustentaculum tali appears to be fractured.

*Case XV.*—Robert Wheelhouse, aged forty-seven years, a machinist. Old fracture of right astragalus. Five months ago the patient fell from a scaffold at the height of five feet and landed on his right foot. He was carried to the hospital and was laid up for six weeks, with a diagnosis of "fracture of the ankle." Since then he has suffered pain in the ankle and has been disabled. Examination shows no peculiar abduction nor obliteration of the concavities. Bony thickening is present under the malleoli, in front of them, and behind them; and the malleoli are nearer the sole than normal. Motion in the ankle joint is

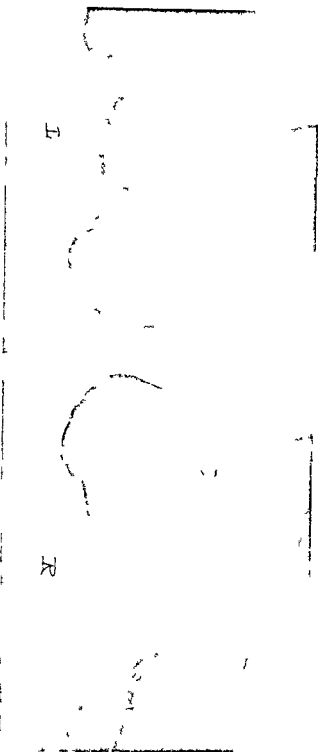


FIG. 6—Old fracture of piston rod. See Case XVI. Normal to axis of rotation for purpose of comparison.



FIG. 7.—Old fracture of both astragali and calcanei, with impaction. See Case XVII.

practically nil At last accounts the patient said he was improving with massage and hot and cold water

The skiagram shows crushing of the body of the bone with displacement of the fragments

*Case XVI*—Lorenzo Cooper, aged fifty six years a watch man Old fracture of left calcaneum Eight months ago the patient fell twenty-two feet out of a window and landed on his left heel He was carried in an ambulance to the hospital where he stayed for four weeks, and where he was treated with plaster of Paris Apparently the diagnosis was fracture of the astragalus He has been lame ever since, and has suffered pain in his ankle and in the sole of his foot Examination shows marked thickening about the heel and disappearance of the normal concavities under the malleoli, the curved line being replaced by a straight one, so that the tops of the malleoli, cannot be distinguished No peculiar abduction can be recognized, but both feet are flat Plantar flexion is limited, dorsal flexion is not Treatment, strapping

The skiagram (Fig 6) shows impaction of the anterior two thirds of the calcaneum, probably crushing of the astragalus also

*Case XVII*—Miss W, aged thirty-nine years a milliner Old fracture of both calcanea, old fracture of left astragalus Three months ago, in delirium, the patient sprang out of a second story window, thinking that she was pursued She landed on both feet, and was carried to the hospital in an ambulance There she stayed for eight weeks, suffering from pain and swelling in both ankles and heels She says her complaint was diagnosed as sprain, and that she was treated with lotions She began to walk in the fourth week and has since complained of pain in both heels and in her right ankle The right foot is the more painful and the seat of the greatest pain in this foot is in the neighborhood of the external malleolus The patient now wears broader shoes than before her injury, though of the same length and is compelled to use crutches Examination at the Hospital for the Ruptured and Crippled Both heels are markedly thickened, the left more than the right This thickening is perceptible to sight and to touch The normal hollows under the malleoli and at the sides of the tendo Achillis are absent in both feet The left foot is adducted, the right foot is slightly

abducted. The outlines of the malleoli cannot be made out. Motion in the left ankle is decidedly restricted. Treatment; operation advised, but not permitted.

The X-ray (Fig. 7) shows marked impaction of the anterior portion of the calcanea, and crushing of the left astragalus.

*Symptoms of Tarsal Fracture.*—The most important symptom of old fracture of the calcaneum or of the astragalus is a thickening of the heel, much more easily detected if the patient presents a sound heel on the other side for comparison. The thickening can be perceived better by palpation than by inspection. Rarely is it possible to tell from the location of this thickening which bone is fractured. The malleoli are nearer the ground than in the normal foot, and their outline cannot be distinctly made out. In fracture of the calcaneum the normal concavities under the malleoli are obliterated, and their place is taken by lines more or less straight. In fracture of the astragalus motion is, as a rule, limited at the ankle. In fracture of either bone the hollows at the sides of the tendo Achillis are usually filled out. Often a peculiar abduction of the heel is present in fracture of the calcaneum, quite different from the eversion of the ordinary flat foot. This form of flat foot, characteristic of the lesion, is readily explained on the hypothesis of fracture of the sustentaculum tali, for the astragalus, deprived of its support on that side, sinks inward. We should expect then, perhaps, that the internal malleolus would be depressed more than the external, as some writers maintain to be a fact. Probably they were dealing with this form of fracture. Others say that the external malleolus usually sinks the more; but they also find that the foot is flattened. Probably these were dealing with impacted fractures in which the external part of the bone suffered the greater damage. Ehret, in maintaining the greater descent of the exterior malleolus, explains the mechanism of this impaction of the outer portion of the bone, and attempts very cleverly to reconcile seemingly

conflicting views In point of fact, neither malleolus "sinks" more than the other, except in relation to some part of the tarsus *As long as the bones of the leg remain intact both malleoli must sink together* This simple fact seems to have escaped notice

In fracture of the astragalus the foot is regularly in adduction The interesting question suggests itself, whether this adduction in fracture of the astragalus, and the abduction in fracture of the calcaneum are merely symptoms, or whether the position which the foot is in at the time of the injury stands in a causal relation to the resulting fracture

The skiagrams of these fractures are much more easily interpreted if both feet be included in the picture They are best taken from the lateral aspect Although it is not always possible to tell by means of the X-ray the exact line of fracture, most of the author's cases of fracture of the calcaneum seem to belong in one of two classes First, fracture of the sustentaculum tali, and, second, impaction of the body of the bone In Case XIII the greater process seems to have been broken into several fragments In fracture of the astragalus true impaction is not demonstrable, probably it never occurs The bone is cracked between the calcaneum and the tibia, as is a nut in a nut-cracker If the force continues, the bone is divided into pieces, sometimes many in number These fragments may be displaced in various directions The posterior portion of the bone generally sustains the greater damage In Case VIII, with the foot in slight plantar flexion, the posterior portion seems to have been split off on the sustentaculum tali, and to have been dislocated backward In Case XV the whole bone is, so to speak, flattened out by the impact of the tibia, again just as a nut would be crushed by a hard blow from a hammer One of these patients with crushing of the astragalus fell from a great height, but the other only a few feet Both patients, however, were quite stout



*Prognosis.*—The prognosis of fracture of the tarsus, when treated in the usual way, namely, as a sprain or as a fracture of one of the leg bones, is distinctly bad. Most of the author's patients with fracture of the calcaneum were more or less disabled, and in not more than one case was the foot completely restored to function. It is not necessary to ascribe entirely the resulting disability to a loss of pronation and supination in the mid-tarsal joint (Ehret), though this may aggravate the symptoms. Nor do we need to accept the teachings of some of the French writers, that the trophic disturbances in the tissues beneath the heel are mostly to blame. In walking, the calcaneum bears the entire weight of the body, receiving a blow with each step; and in standing it bears a great part of the weight. The slightest change in the structure of the bone can readily cause great discomfort (Bähr). A small exostosis on its lower surface would have much the same effect as a loose stone in the heel of the boot. Again, almost invariably, except with tear fractures of the posterior part, some joint of the calcaneum is involved in the fracture, and is therefore distorted.

In fracture of the astragalus, the prognosis depends largely upon the amount of dislocation of the fragments. Cases VIII and XV of the author's series in which there was much displacement, have an absolutely stiff ankle, and are incapacitated for work. Case XI, with but little displacement, had a good result, and the patient pursues his occupation of chauffeur with little difficulty. Case IX, also without much displacement, when last seen was doing fairly well. Case XVII had a small amount of motion in her ankle, but complained of more discomfort in the foot in which the astragalus was not fractured. In none of the author's cases was the fracture compound. In compound fracture the prognosis might be different.

*Treatment.*—It appears from the foregoing that the treatment of these old fractures is unsatisfactory. Hot and cold baths, massage, strapping, and occasionally a

Whitman brace, may be tried, sometimes with fair results. In fracture of the astragalus with dislocation of the fragments, removal of the bone offers the only relief (Destot, Vegas, and others). In fracture of the calcaneum with an exostosis in the sole, the protruding piece of bone can be chiselled off (Bähr).

The best results in the treatment of crush fractures are to be obtained at the time of their occurrence. With an impacted fracture of the calcaneum the impaction should be broken up if possible, and the foot should be put up in adduction and dorsal flexion. Bouchet's recommendation of lateral pressure to break up the impaction is worth trying. In fracture of the sustentaculum tali, the indication is clear, strong adduction and dorsal flexion will cause the astragalus to pull this process back into its place. The foot should be fixed in that position.

In fracture of the astragalus without displacement of the fragments, the main indication is strong dorsal flexion. When the fragments are displaced their dislocation should be reduced, if necessary by an open operation. In this connection compare Cases VIII and XV of the author's series in which the fragments were not replaced with Urban's similar case in which the ankle was opened and the dislocated portion of the bone reduced. In the first two cases the patients have a stiff ankle in the last Urban reports a complete recovery with a good joint. If the fragments cannot be replaced, they should be removed.

A good general rule in all tarsal fractures where the facilities for making an exact diagnosis are lacking, is to put the foot up in extreme dorsal flexion and in inversion.

The best form of splint, after the primary swelling has subsided, is one of plaster of Paris reaching from the bend of the knee to the toes. Under no circumstances should the patient bear any weight on his foot before the expiration of two months.

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# COLOSSAL DERMOID CYST OF OVARY OF OVER FIFTY YEARS' GROWTH.

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Surgeon to the Danbury Hospital.

THE accompanying illustration is contributed as an exhibit of a dermoid cyst of the ovary of unusual size and duration of growth, since cysts of that class seldom exceed in size a man's head.

The subject was a maiden lady, 60 years of age, in whom an enlargement within the abdomen was first noticed when she was ten years of age. It was then attributed to a fall sustained a short time previous. It slowly increased in size and made the greater part of her life one of invalidism. She finally, in September, 1906, entered the Danbury Hospital, that the tumor might be removed. This was done happily, September 17, and was followed by an uncomplicated recovery. The weight of the cyst and its contents was 32 pounds. The photograph (Figure 1) was taken immediately before the operation.

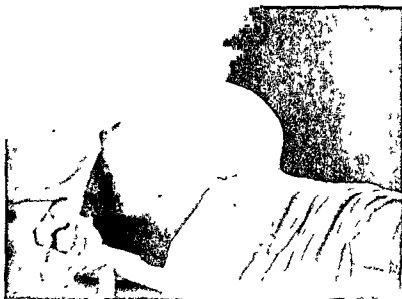


FIG 1—Dermoid cyst of ovary of fifty years standing. Weight 32 pounds. Prompt recovery. Removed at Dabury Hospital September 1905.



# EXTIRPATION OF A HYPERNEPHROMA, WEIGHING FOUR AND A QUARTER POUNDS, FROM AN INFANT TWENTY MONTHS OF AGE.

RECOVERY

BY WILLIAM S. CHEESMAN, M D ,  
OF AUBURN N Y

THE patient, a boy aged one year and eight months, was referred to me by Dr M P Conway, Aug 26, 1906 Family and personal history unimportant Four months ago mother observed veins of right testis were swollen Gradual enlargement of the abdomen followed Appetite fair, and bowels acted normally No urinary disturbance Though irritable and fretful, child seemed not to have pain Chief complaint, swelling of the abdomen

Examination showed an infant thin but not emaciated and pale but not cachectic Abdomen enormously distended by a soft, solid growth, smoothly rounded everywhere except in the right flank, where a knotty mass was perceptible Flatness everywhere on percussion, and a thrill on tapping the surface No tenderness Urinalysis shows no albumin or sugar, and no pus, blood, or other morbid deposit

*Operation*, Aug 29 —Ether Patient in Trendelenburg position, as recommended by Abbe to lessen bleeding and to keep the blood in the head after release of the abdominal vessels from pressure by the growth, thus diminishing shock

In view of the great size of the tumor I selected the transperitoneal method, splitting the right rectus muscle from the costal arch nearly to the pelvis The lumbar incision seemed to me not to offer so good access to a mass filling the belly, while the injury to the abdominal musculature would necessarily be greater, as the muscle fibres must be in part divided

Statistics of the two operations give (Kuester) a mortality of 26.62 per cent for the transperitoneal, and 24.70 per cent for the loin incision Even if this statement is accurate—and Jonnesco in 17 operations had a lower mortality from the transperitoneal route—the figures mean simply that it was the larger



and more complicated growths that required access by laparotomy, the higher mortality depending on the inherent difficulty of the cases, not on the operative method employed.

The statement that cases operated by the loin give one-half more permanent recoveries than those operated by the anterior route, is doubtless to be similarly explained.

The rectus opening gave a good view of the mass (Fig. 1), which with huge veins coursing over its surface presented a formidable appearance. Perpendicularly on its anterior face lay the ascending colon, lifted along with the posterior layer of peritoneum, behind which the tumor had developed. The other intestines were crowded over to the left, out of sight. In the peritoneum, constituting the anterior covering of the mass, an opening was made with scissors to the right of the colon (in order not to jeopardize its nutrient vessels coming from the left). Through this opening, by finger dissection, the peritoneum with the ascending colon was stripped from the tumor. Bleeding was free during this step, and required pressure with hot gauze to control. Indeed, the greater part of the blood supply of the growth seemed to come from these peritoneal vessels enlarged to meet its needs. Working behind to the right, I found and freed the kidney, and then by pressure on the outside of the abdomen, the tumor, *plus* the kidney attached by its upper pole, were delivered through the incision, which, generous as it was, had to be widely stretched to permit the extrusion of the mass. As this emerged it revolved to the right, like a geographical globe, exposing the pedicle, consisting of renal vessels, etc. (Fig. 2). An infected gland was disentangled from their midst, and then a catgut ligature applied, and the mass cut away.

It would have been possible in this case, I think, by a plastic resection to have preserved the portion of kidney not implicated in the growth, as was done by Abbe in one of his cases. But the child's condition became so bad that choice was made of the most rapid means of ending the operation.

Inspection now showed that the mesocolon stretched over the left side of the tumor had in the process of enucleation been torn from its gut for a space of some four inches. Here, too, there was no time for other course than to rejoin it as rapidly as possible to the colon, and hope for anastomotic restoration of the blood supply,—a hope happily justified by the event.

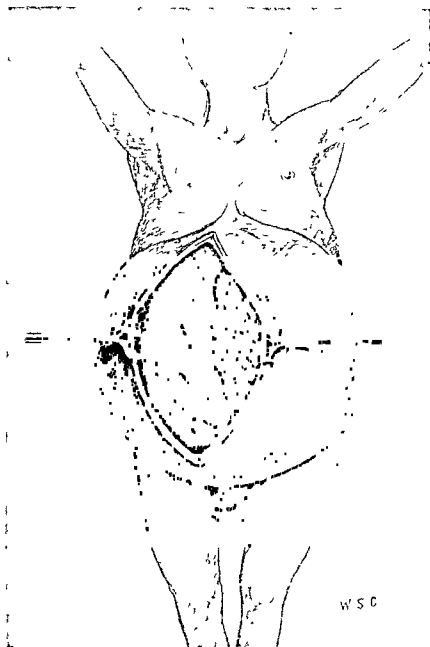


FIG 1—Appearance of tumor on opening abdomen. Note ascending colon and varicocele

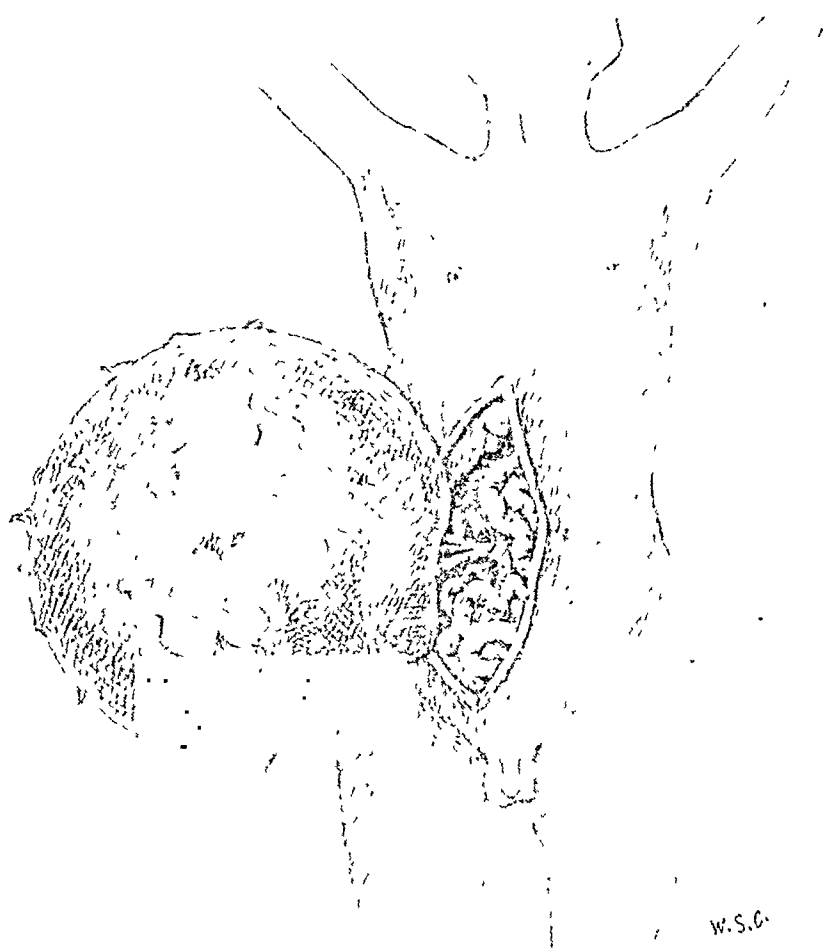


FIG 2—Schematic view of tumor delivered, still attached by pedicle. Note right kidney and tumor attached to its upper pole.

The opening made by scissors in the posterior peritoneum went for similar reason unsutured. The abdominal cavity was filled with hot saline, and the wound of entry quickly closed in tiers. Thus the child got off the table deeply shocked but alive which was almost more than had been hoped. Time of operation, 32 minutes.

Hypodermic stimulation, coffee and whiskey by rectum patient placed at a slant head down in bed. Temperature 102° in the evening but fell to normal next morning and remained there. Recovery was in all respects uneventful. The patient now taking on weight and looking rosy.

The tumor weighed four and a quarter pounds. Dr. Sondern to whom a specimen was sent for sectioning reported it to be hypernephroma.

One of the latest reviews of the prognostics of operation for malignancy of the kidney is contained in the "Handbuch der Urologie," 1905, edited by Frisch and Zuckerkandl. The writer (Paul Wagner) finds the operation mortality much reduced in recent years—from 61.22 per cent (Gross) to 24.44 per cent (Kuester). Schmieder's statistics gives 64.3 per cent operation mortality in the first decennium of renal surgery, 43 per cent in the second, and 22 per cent in the third. But the mortality among children is still 28.1 per cent.

As regards permanence of cure the literature furnishes but 34 cases living beyond the two year limit *recidiv frei*, and 21 cases beyond three years—16 adults 5 children.

So that while the case reported may be regarded as a fortunate instance of operative recovery, permanency of recovery can be affirmed only after some years.

# INTRAPERITONEAL RUPTURE OF THE URINARY BLADDER.

WITH REPORT OF A CASE OPERATED TWO HUNDRED AND FIFTY-FOUR  
HOURS AFTER ACCIDENT; WITH RECOVERY.

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On Sept. 28, 1904, a man was brought to Cook County Hospital, Chicago, with intraperitoneal rupture of the urinary bladder. Eleven days previous to admission he had received an abdominal injury, since which he had suffered from anuria and a progressive abdominal distension. He was operated two hundred and fifty-four hours after the accident, and was discharged from the hospital on the tenth day well.

The time element is the important and interesting feature in this case. It is unique in medical literature. Two hundred and fifty-four hours after the abdominal injury laparotomy was performed, the bladder sutured, and the patient made an uneventful recovery. Blumer (*British Med. Journal*, 1903, 1, 789) reported a case operated the sixth day after injury, with recovery. I believe Blumer's case has the longest intervening time from injury to operation of successful cases reported to date.

CASE REPORT.—F. G., a laborer, 45 years of age, was brought to the receiving ward of Cook County Hospital in the police ambulance, Sept. 28, 1904, at 6.17 P. M. He stated that ten days previous to admission he had been carousing and drinking during almost the entire night. About 4 A. M. he became involved in a brawl and was kicked several times in the right side just above the crest of the ilium and about the trochanter major. He had considerable pain in the abdomen and at the seat of injury at the time, and had to be taken home. In a few hours he felt better and tried to work for the following two days. But

the pain in the abdomen became so severe that he had to quit work on the second day. About the time he quit work he noticed that the abdomen was somewhat distended and since that time the swelling had gradually but slowly increased in size. Ever since he was injured he has been unable to void much urine but has had very frequent desire to urinate only a few drops being voided at a time. Since the injury what urine he has passed has been distinctly bloody. For the past eight days the abdominal pain has been very severe and he has vomited several times a day. He thinks he has had no fever since the injury. There is a distinct alcoholic history extending over many years.

He was a fairly well developed middle sized man past middle age of life. He lay on his side with legs drawn up. He complained of great distress in his abdomen and vomited during examination. Skin dry and cool. Pulse considerably accelerated regular but very weak. Respiration somewhat rapid. Abdomen markedly distended tense with shining walls. Umbilicus protruding subcutaneous veins prominent. On palpation there was some tenderness over entire belly. Percussion showed dulness over entire abdomen. A distinct impact was given on tapping the abdominal wall anywhere. There was no evidence of contusion of abdominal wall. Remaining examination had no points of interest.

The catheter was then passed and 5 800 cc of blood tinged urine was withdrawn. Abdominal distension disappeared and tympany obtainable but still signs of fluid in abdomen. The record at this time shows temperature 98 pulse 108 respiration 24. Patient was sent to operating room. The following notes are taken from history sheet.

*Operation*—Operator Dr George F Thompson. Incision in median line four inches long beginning one inch above symphysis pubis. Abdominal cavity opened. About 2 000 cc bloody urine found free in peritoneal cavity. On superior surface of the bladder in median line was an opening with ragged edges which admitted the thumb rather tightly. Opening in bladder sutured by Czerny Lembert method using medium sized silk sutures. Abdominal cavity flushed with normal salt solution. Serosa smooth and shining. Peritoneum and abdominal wall closed by separate layer method.

Bladder was drained for five days by means of catheter through urethra. The patient made an uneventful recovery, temperature never being above 100.6°.

It is noteworthy in this case that the patient performed his work as a laborer an entire day after the accident, and was not compelled to take to bed until the second day was well advanced. The symptom of shock was entirely absent, it being most probably that the patient had to be taken home after the injury more on account of intoxication than on account of the injury itself.

Yet, it is well known that serious injury to persons under the influence of alcohol often lacks just this element of shock, which is so important in the diagnosis of internal injuries. So, too, is rupture of the urinary bladder a relatively common occurrence in intoxicated persons, owing to the distension of the organ and to the dangers of trauma in this condition. On this point I quote Dr. Ashhurst (*Am. Jour. Med. Sc.*, July, 1906).

Another predisposing cause of importance is the condition of intoxications. Over 72 per cent. of the patients in whose records this point is mentioned, are reported as being more or less drunk at the time of the injury, and it is a sad fact that in not a few instances in which the patients themselves were sober, they sustained their injuries because of intoxication in some one else (Rose, Zoldewitch). Not only does drunkenness predispose to injury in this way, by making the individuals both quarrelsome and unsteady on their feet, but it increases the amount of urine excreted, and by dulling the sensibilities renders the persons so affected often unconscious that their bladders are overdistended, and may even deprive them, when drunkenness is a long continued habit, of the power of completely evacuating their bladders. The result of this last state—atony of the bladder—is that, although the patient may have passed his urine within an hour or so of the accident, his bladder may still be quite sufficiently distended to predispose it to rupture when subjected to sudden injury. Another serious aspect of intoxication in these patients is that they frequently remain unconscious of the gravity of their injury, as in the case of my own patient, and sleep off their drunken state only to awake the next morning with a peritonitis fully developed, which could almost certainly have been prevented by prompt operation.

It is worthy of note that among the patients who were intoxicated at the time of the accident, the mortality was over 43 per cent; while among the sober it was less than 28 per cent.

I shall not follow further the questions of symptoms and diagnosis, because these points have recently been exhaustively treated in Dr Ashhurst's paper

Herrick<sup>25</sup> reported the cases occurring in Cook County Hospital, 1889 to 1893. Out of a total of 8 000 surgical cases there were five of rupture of the bladder, an incidence of 0.625 of 1 per cent. St Bartholomew's Hospital report quoted by Herrick, mentions but two cases out of 16,711 surgical cases occurring in the years 1869 to 1875, an incidence of 0.125 of 1 per cent. At the Episcopal Hospital Philadelphia, from January 1, 1900, to January 1, 1905 there were 8,367 surgical patients with three intraperitoneal ruptures of the urinary bladder, or 0.37 of 1 per cent (Ashhurst)

The question of cirrhosis of the liver with ascites was brought prominently to the fore in discussing the differential diagnosis of this case. With the marked alcoholic history, the enormous distension of the belly with fluid, prominent veins—these spoke volumes for portal obstruction. The history of injury eleven days previous made one hesitate to pronounce rupture of the bladder on account of the good general condition of the patient, for the common text book leads one to expect a rapidly fatal issue. However Ullman cites from the literature a case which died on the sixteenth day. A case is recorded by Ledderhose which survived the immediate results of the injury, and recovered after the opening on the seventeenth day, of an intraperitoneal abscess in communication with the bladder.

The sudden development of ascites following trauma, the strangury, blood from urethra, and the practical anuria for eleven days made the diagnosis of intraperitoneal rupture of the urinary bladder the most probable. The passage of the catheter was decisive.

The academic question of peritonitis following rupture of the bladder is an interesting one. If an aseptic urine does not produce peritonitis in eleven days, how many days are necessary? I believe the proposition that peritonitis is



not an inevitable sequence is easily tenable. Therefore, soundings and catheterizations must always be made with utmost caution in all suspected cases.

Samuel Alexander<sup>1</sup>, in reporting forty-five cases, his own and from the literature, stated that the time elapsing between accident and operation varied from two to ninety hours. Until Blumer's<sup>24</sup> case on the sixth day with a successful issue, ninety hours was the longest time elapsing. In this reported series of forty-five, twenty-three died,—sixteen from peritonitis, two shock, two hæmorrhage, one pneumonia, and two died on table. In four cases peritonitis was due to imperfect suturing. In eighteen cases no drainage was used,—nine recovered, nine died. In twenty-one cases catheter introduced into bladder and retained several days,—eleven recovered, ten died. Two cases, bladder drained by suprapubic method, and both recovered. Jones<sup>2</sup> added nine cases to the Alexander series, and, in commenting on these, states<sup>4</sup>: Thirty-two reported prior to 1893 had a death rate of 63½ per cent.; twenty-two reported since 1893 had a death rate of 27½ per cent.,—thus showing an improvement of 36 per cent.

In Ashhurst's recent report of one hundred and ten cases sixty-three patients recovered and forty-seven died, a mortality of 42.72 per cent. To this series we may add Marnock's two with no mortality, M. L. Morel's four cases with one death, and the case herein reported, making a total of one hundred and seventeen. Of these sixty-nine recovered and forty-eight died, a mortality of 41.02 per cent. for all reported cases. If to Jones' twenty-two cases reported occurring since 1893 we add the seven recent cases, out of a total of twenty-nine seven died, a mortality of 24.1 per cent. Thus we note the gradually lessening rate of mortality under asepsis, and modern methods of diagnosis and treatment.

Willett<sup>9</sup> reported a case in 1876, Heath<sup>9</sup> in 1879, Bull<sup>9</sup> in 1885, all three dying from imperfect suture. McGill<sup>9</sup> reported a case in 1886 which died from operative shock.

MacCormac<sup>12</sup> in 1886 reported two cases, the first successful ones on record, in which there was celiotomy and suture. He ascribed his success to the fact that he sutured only the musculature and serosa, while previous operators had always included the mucosa. Before MacCormac's triumph in bladder suturing, practically all patients with intraperitoneal rupture were doomed to die. Ullman<sup>16</sup> collected 143 cases prior to 1886, only two of which recovered.

While a complete analysis of the literature with reference to the mechanism in intraperitoneal rupture of the urinary bladder was not made, the most common is from blows on belly wall by some blunt instrument, the booted foot playing a prominent rôle.

Intraperitoneal rupture also occurs in fracture of the pelvis from crushing injuries, but is usually associated with extraperitoneal rupture as well. Sugetinow<sup>3</sup> reports a case of intraperitoneal rupture due to heavy lifting. During the excessive physical effort the patient felt a sudden, tearing pain in the lower abdomen. The patient lay in bed five days in a serious condition, but from the obscurity of the symptoms, diagnosis was not made. On the fifth day he was again seized with severe pain. The fatal issue occurred on the eighth day. Autopsy showed purulent peritonitis from rupture of the bladder. Sugetinow believed the rupture involved only the mucous and muscular coats until the fifth day. Intraperitoneal rupture has been reported in cases of vesical cancer. This accident must be kept in mind in dealing with this condition as the life of the patient can be considerably prolonged by either permanent suprapubic or perineal drainage. Loumeau reports a case in which he shows that lithotrity in inexperienced hands may result in laceration of the bladder, and on account of the non repair of the accidental lesion, may be followed by leakage and fatal peritoneal infection. The same author mentions another case that is an example of mixed rupture, spontaneous in appearance but in reality produced by a trauma dating back thirty years, a hypo

gastric traumatism received at that time resulted in contusion of the bladder with a prevesical hematoma followed by adhesions between the bladder and the abdominal wall. These adhesions under the influence of violent and repeated movements, finally broke away from the walls of the bladder at their point of implantation on the organ, from which resulted a tear in the bladder wall.

My own connection with this case was that of examining surgeon in the receiving ward.

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## DRAINAGE OF THE PREVESICAL SPACE THROUGH THE PERINEUM IN SUPRAPUBIC CYSTOTOMY \*

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SUPRAPUBIC cystotomy admittedly affords the best access for intravesical operations and when primary union of the incision is secured, leaves nothing to be desired

Usually, primary union is not secured nor even attempted, and since drainage of the urine through a suprapubic tube—i e, against gravity—is a failure, leakage into the prevesical space commonly occurs in spite of the many ingenious devices intended to avert it, including the purse string suture and siphon drainage Stagnation of urine in this space invites infection, sepsis pneumonia, and compels prolonged confinement to bed Hence the mortality of the suprapubic is in elderly patients distinctly greater than that of perineal incisions for the same purpose, notably prostatectomy

In spite of this greater mortality suprapubic has largely superseded perineal prostatectomy in Europe, because the latter operation, by transforming the perineum into cicatricial tissue, entails so many distressing sequelæ—perineal and rectal fistulæ (in 8 per cent of 2,000 cases), permanent incontinence of urine (3 per cent), cicatricial contraction of the prostatic urethra, besides impotence, epididymitis and other minor ailments

Stagnation of urine and tissue fluids in the loose prevesical tissues can be prevented in two ways (1) By abolishing and (2) by effectively draining these tissues Abolition of loose tissues is secured by making the operation in two stages five days apart, when this is done under nitrous oxid anæsthesia the risks are minimized

The obvious objections to this method are avoided by the other plan, which, so far as I can learn, has not yet been recorded nor practised. This consists in drainage of the prevesical space into the perineum—at the bottom instead of the top—with complete closure of the suprapubic wound. The procedure is this: When the operator is ready to close the wound, the membranous urethra is opened on a grooved staff, the gorget introduced and staff withdrawn; a small trocar and canula is passed from above along the anterior surface of the bladder and prostate into the groove of the gorget. The trocar being withdrawn, a few silkworm strands are threaded through the canula and along the gorget out through the perineal wound (a small perforated rubber drain may be attached and drawn through by the threads). A large, soft catheter with multiple perforations having been introduced into the bladder for perineal drainage, the suprapubic incision, bladder and abdominal wall are closed completely except where the threads protrude, the anterior bladder wall being anchored near the recti muscles. Urine which may leak through the bladder wound, and tissue fluids, find ready exit at the bottom of this space.

In nine of eleven cases in which I have made this operation the wound has been entirely healed within two weeks; in the remaining two—prostatectomies in which oozing blood was allowed to block the perineal drain—the wound was reopened for the insertion of a larger drain. Greater care in checking oozing with formalin gelatine, should prevent this mishap.

# DRAINAGE OF PROSTATIC ABSCESES THROUGH THE ISCHIO-RECTAL FOSSA

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A MAN, aged 23 was admitted to Bellevue Hospital suffering from an abscess of the prostate. The abscess was felt by rectal examination as a tumor the size of a small hen's egg, situated in the median line and extending over to the left side. The patient gave no history of venereal infection but said that he had been recently undergoing urethral instrumentation.

*Operation*—In opening the abscess the approach to the prostate was by a lateral route which being along natural planes of separation of the tissues through the ischio-rectal fossa and along the anterior pubic fibres of the levator ani, afforded easy access to the site of incising the tumor.

The accompanying figures, drawings over photographs of the dissections, illustrate the surgical anatomy of this method of lateral approach to the prostate for opening an abscess, and the steps of the operation. Drainage was made through the patient's left ischio-rectal fossa, though the illustrations show the anatomy of the right side.

Fig 1 shows the line of the skin incision (A) projected upon the fascia forming the floor of the ischio-rectal fossa, and its relations to the tuberosity of the ischium, the external sphincter, and the gluteus maximus. There is here some distortion from the normal relation to the anal opening, owing to the relaxation of the sphincters in the dead subject. The incision starts at the fore part of the prominence of the tuberosity of the ischium at its inner aspect, which point is about on a transverse line passing through the anterior margin of the closed anal opening, and is carried diagonally backward and inward across the floor of

the ischio-rectal fossa in the space between the fibres of the external sphincter and the gluteus maximus muscles. The front portion of this incision, lying just internal to the tuberosity of the ischium, is deepened until it extends about one-half to three-quarters of an inch above the level of the extremity of the tuberosity, after which the finger introduced into the wound and passed along the smooth obturator fascia (Fig. 2, *B*) covering the inner surface of the tuberosity, enters a distinct fascial compartment (Fig. 2).

Fig. 2 shows this fascial compartment which lies in the outer portion of the ischio-rectal fossa, opened up. Usually no vessels traverse its space. It is limited externally by the firm obturator fascia (*B*) which is the guide to its ready detection by the entering finger, as described above. The apex of the space passes a little forwards above a transversely elevated band of tissue (*C*) in its anterior wall. The contour of this elevated band conforms to the base of the triangular ligament and, lying along the latter, the transverse perineal vessels and nerves. The fascia at the apex of the compartment—*i.e.*, just above the transverse band and consequently above the base of the triangular ligament—is now carefully punctured in a forward direction (indicated by the arrow), after which the finger is pushed through the opening into a plane of cleavage above the triangular ligament along the anterior bundle of levator ani fibres (Fig. 3, *D*), which follows the pubic ramus.

Fig. 3 shows the plane of cleavage along the anterior levator ani fibres above the triangular ligament, which the finger enters and dilates through the incision at the apex of the fascial compartment. In the dissection from which this picture was made, the base of the triangular ligament (*E*—posterior layer) on the right side was cut transversely across at the fore part of the ridge of tissue (*C*), after having first severed from the ramus for a short distance in front of the fascial compartment the superficial fascia, and with it the origin of the transversus perinei muscle. The tissues of the urethral triangle in front of this dividing incision,



Fig. 1.—A line drawing of skin is on projected upon the fascia form. The floor of the sacro-rectal fossa. It begins at the crease of the prominence of the tuberosity of the ischium about 6 cm. a transverse line passing through the anterior margin of the coccyx and passes backward and inward between the external sphincter and the gluteus maximus muscles.





FIG. 2 shows the fascial compartment in the outer part of the ischio-rectal fossa, limited externally by the firm obturator fascia (B), which is the guide in entering the compartment. The compartment was here laid open, instead of by the incision A, Fig. 1, by an angular incision, one arm of which ran along the inner margin of the tuberosity of the ischium, and the other parallel to, and a little in front of, the lower border of the gluteus maximus muscle. C, transversely elevated band of tissue in anterior wall of fascial compartment, containing transverse perineal vessels and nerves and the base of the triangular ligament. The arrow indicates the direction of the puncture at the apex of the fascial compartment and its situation above the level of the transversely elevated band or base of the triangular ligament.



Fig. 3 shows the base of the triangular ligament of the eye (D) above the triangular ligament (C) of the eye. The base of the triangular ligament (C) is the point of origin for the transverse ligament (D). The structures labeled E, F, G, H, I, J, K, L, M, N, O, P, Q, R, S, T, U, V, W, X, Y, and Z are the various muscles and ligaments of the eye.

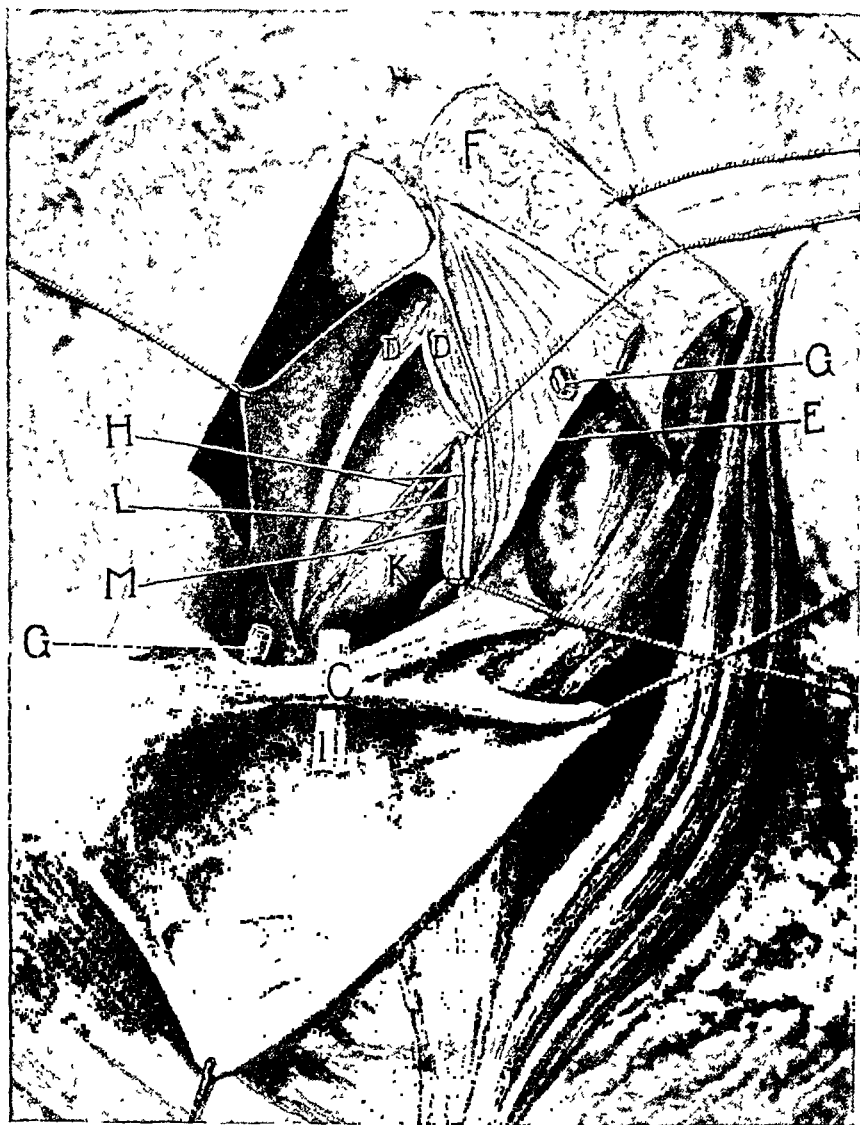


FIG. 4.--Shows the anatomical structures that would lie between a prostatic abscess, bulging toward the rectum and laterally, and the finger introduced through the fascial compartment of the ischio-rectal fossa (in the course of the stick I) into the plane of cleavage along the anterior levator ani fibres above the triangular ligament. D D, anterior levator ani fibres which have been split apart to show immediately above them the recto-vesical fascia (H.) This fascia has been cut transversely along the lateral margin of the prostate (K) together with the recto-urethralis muscle (L) and the fascia (M) lining the prerectal space. The prerectal space has been opened up by blunt tearing of the delicate connective tissue which normally maintains its obliteration, so that the rectum sags backward, and through the opening in the recto-urethralis muscle the situation of the base of the prostate (K) can be seen.

together with a longitudinal slice of the adjoining ramus (*F*) were then reflected over to the left so as to expose the plane of cleavage above the triangular ligament to view. The bridge of tissue (*C*) left in situ contained a small portion of the base of the triangular ligament and the transverse perineal vessels and nerves. Above this bridge through the slit at the apex of the fascial compartment a stick (*I*) has been passed to show the course of the finger as it enters the dilatable area along the anterior fibres of the levator ani. The only possible danger to be guarded against when puncturing the apex of the fascial compartment is that of injury to the internal pudic artery (*G* *G*). This artery had to be severed in the dissection to permit the reflection of the tissues. It lies a little external to the site of making the puncture being in juxtaposition to the puncture at a point just where it emerges from the fibrous compartment of the obturator fascia. Thence the artery passes forwards to enter the compartment of the triangular ligament where it lies close to the ramus. It could only be injured by an outward cut which should consequently be avoided.

Fig. 4 shows the relation of the prostate to the rectum and to the structures which would intervene between a bulging prostatic abscess and the finger which has been passed into and has dilated the plane of cleavage above the triangular ligament. The first of these intervening structures is the levator ani muscle (*D* *D*) at its anterior aspect the fibres of which have been split apart to show above them the next structure which is the recto vesical fascia (*H*) covering the side of the prostate (*K* inferior aspect) and reflected down over the recto urethralis muscle to pass below between the external and internal sphincters of the anus. A transverse cut has been made in this fascia just below the edge of the prostate to reach next the recto urethralis muscle (*L*) which in turn has likewise been cut transversely across in the line of the incision in the fascia being thus divided close to its origin from the side of the

prostate. Beneath the recto-urethralis muscle is the fascia (*M*) lining the prerectal space. In this dissection the prerectal space, normally no actual space at all, but, as it were, a collapsed fibrous sac located between the rectum behind and the bases of the bladder and prostate in front, and capable of easy dilatation by blunt force, has been opened up, so that the rectum sags backwards, and the locality within this space corresponding to the base of the prostate (*K*) is seen through the opening in the recto-urethralis muscle.

In the case now reported, after having dilated the plane of cleavage along the anterior levator ani fibres above the triangular ligament with the finger, the abscess could be felt in the bottom of the wound as a prominent rounded elastic tumor, and was readily incised by a narrow-bladed knife passed along the finger. The artery to the prostate enters near the postero-lateral corner of the organ and ought not to be injured by the incision. The branches of the middle hæmorrhoidal artery, when present, lie close to the rectal wall antero-laterally, and would be pushed backwards out of danger by the bulging of the abscess. After the pus was evacuated, the cavity was drained with a tube surrounded with gauze. The *bacteriological examination* of the pus showed the infection to have been due to the staphylococcus.

*Course.*—The drainage material was rapidly diminished in amount so as not to interfere with the contraction of the abscess cavity. The wound healed from the bottom. On the fourteenth day the wound sinus was one and a half inches in depth. On the fifteenth day the patient left the hospital voluntarily. The wound healed uneventfully, and the patient had a perfect recovery.

This operation is suggested for cases of prostatic abscess of the kind here described which have not ruptured into the urethra and present a tense elastic tumor bulging toward the rectum. It is not recommended for cases where the abscess has ruptured into the urethra, when the operation of perineal section with drainage of the bladder advised

by Alexander<sup>1</sup> would be undoubtedly indicated. Left to itself a prostatic abscess will open either into the urethra into the rectum, or it will break laterally and then frequently burrow along the anterior levator ani fibres into the ischio rectal fossa. Since the last mentioned route is a natural channel through which the pus of a prostatic abscess can discharge itself without liability of serious complication it would seem not improper to employ this same route as the one of approach for the early evacuation of such an abscess. Alexander advises perineal section indiscriminately for all cases of prostatic abscess with a view of avoiding sinus formation or recurrence that would follow improper drainage of the abscess cavity. The claim of the writer is that if one good result *can* be obtained by this method for the class of cases mentioned in support of its employment for these cases, it can be said that the operation is certainly much simpler of performance than that of perineal section the after treatment does not require special surgical knowledge, the after discomfort to the patient is less the bladder is not exposed to any danger of infection and there is no subsequent urinary fistula to be treated all of which facts would certainly appear as advantages in offering this method for trial, over the more radical operation even though the latter be capable of producing an undoubted good final result.

As compared with simple drainage of a prostatic abscess by the anterior perineal incision, going between the bowel and the urethral triangle the possibility of doing which by a definite anatomical dissection has been shown in 1902 by Gosset and Proust<sup>2</sup>, and in 1904 by the writer<sup>3</sup> drainage by this diagonal lateral incision and approach through the ischio rectal fossa would seem to have the preference for the following reasons. The route is direct and easily accessible, no danger of injuring the rectum or urethra, the scar is smaller and laterally situated.

The simplicity of this operation should at least appeal, if only as a temporary measure of relief, to the general

practitioner who may be called upon to relieve one of these conditions under surroundings unfavorable for performing more than the simplest operative measure.

For the proper treatment to obtain healing of an abscess of the prostate opened by the lateral route, the writer would suggest the following requisites: (a) The free and dependent drainage of the abscess cavity through a wide opening in the abscess wall; (b) the early removal of the drainage from the deep portion of the wound, to permit collapse of the bottom of the sinus; and (c) particularly the avoidance of irritating disinfectants, such as bichloride of mercury, carbolic acid, and potassium permanganate, for the syringing of the sinus. Peroxide of hydrogen, which is the best antiseptic solution for cleansing an abscess cavity, or a solution of chinosol<sup>4</sup> 1 in 500, or simple boiled water alone should be used, none of which agents destroy tissue. As the deep part of the wound contracts, in order to insure its closure the drainage tube should reach only to within about two inches of the bottom, and should be progressively shortened as deep obliteration of the track takes place. As the discharge lessens and the track begins to granulate healthily, the closure of any sinus seems to be favored by suspending syringing altogether.

Lateral incisions for approach to the prostate have been reported by Dittel<sup>5</sup> in 1890, and by Delagénère<sup>6</sup> in 1900.

Dittel's method was employed solely for the removal of a lateral lobe of the prostate. He made his incision from the tip of the coccyx toward the anal margin in the median line, then around the external sphincter, ending at the perineal raphe in front. Delagénère recommended his method especially for hypertrophy of the prostate, also for abscess and malignant disease. His incision, which he called the longitudinal or parasacral incision, began at the base of the scrotum, descended in the median line to within two centimetres of the anal opening, turned thence in a semicircle around the anus, then followed the median line again to

the tip of the coccyx, and finally passed along the lateral margin of this bone

Both Dittel and Delagénière are indefinite as regards the surgical anatomy of their operations. They both insert a sound into the urethra to prevent its injury

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## SILVERIZED CATGUT,

A STUDY OF THE METHOD OF CRÉDÉ FOR STERILIZING CATGUT WITHOUT HEAT.

BY JAMES EDDY BLAKE, M.D.,

OF BROOKLYN, N. Y.

As is well known, Professor Cr  d  , of Dresden, has advocated the use of colloidal silver and silver salts in the treatment of various forms of infection, and also as a means for preventing infection. Many of these preparations are very efficient as antiseptic agents and are practically harmless. This is especially true of collargolum, which can be used intravenously in doses of 5 to 10 c.c. (1.25 to 2.50 drachms) of a 1 per cent. solution.

By treating catgut with colloidal silver the catgut itself is not only made sterile, but it becomes impregnated with an efficient and innocuous antiseptic agent which exercises a local inhibiting influence upon the growth of any bacteria which may have been introduced in the wound from any cause.

My personal observation during a visit paid to the clinic of Professor Cr  d  , substantiated the claims made for the advantage of such catgut for ligatures and sutures. I found that Professor Cr  d   used catgut sutures almost exclusively; that there was no post-operative infection attributable to the inefficient sterilization of the catgut, and, that post-operative infections from any cause were very rare. Cr  d  's treatment of the catgut was to impregnate it with colloidal silver, and preserve it dry; then, several days before use, it was placed in alcohol.

In the spring of 1905, while engaged in laboratory work in connection with the service of Dr. L. S. Pilcher in the Methodist Episcopal Hospital in Brooklyn, I undertook, through his advice and by his direction, to test specimens of catgut prepared in a manner similar to that of Cr  d  . The

tests covered a period of several months, and the present paper records the results of these observations

Collargolum is simply metallic silver prepared in such a manner that it is soluble in water, but not diffusible through animal membrane. It was first described by Lee, in 1889, but was first prepared in a form practicable for use by Professor Crede several years later. It occurs as simple, hard, brittle, bluish black, scale like pieces, which are soluble in water to the extent of 1 to 20, the solution being dark olive-brown in color and remaining stable for months.

No silver particles can be distinguished in the solution when observed under the highest powers of the microscope. It is not diffusible, and, in contradistinction to other inorganic bodies, the addition of albumin to collargolum prevents or delays the precipitation of acids and salts. A sufficient amount of albumin is therefore added to the collargolum during its manufacture to prevent its precipitation under ordinary conditions. Collargolum is unaffected by boiling, but boiling is quite unnecessary, as the solution is itself antiseptic.

"Collargolum may be introduced into the system intravenously, subcutaneously, endermically, or by mouth or rectum. Introduced intravenously it circulates in the blood for about eight to ten hours, and is then deposited in the organs or eliminated. It appears to be excreted through the intestines and kidneys, and never produces argyria. The elimination of silver is greatest during the first days. It can be detected after a week, and only after a month disappears entirely.

"No matter by what method the silver is introduced into the body, it exerts a markedly antiseptic action, and directly combats septic infection, whether due to staphylococci, streptococci, or similar bacteria, alone or combined with the bacteria of decomposition, which intensify the action of the pyogenic bacteria."—"Colloidal Metals in Medicine" Brochure J. L. Berger, Berlin, 1904.

Collargolum therefore fills a very important place in the combatting of septic disease, and its marked usefulness is

attested by a large and growing literature both German and foreign.

Our first test was directed to determine whether there would be any advantage in soaking the catgut in ether before immersing it in the collargolum solution. A strand of catgut was divided in half and each half was wound on a glass spool; one spool was placed in ether for five days, the other was kept dry. Both were then immersed in a 1 per cent. solution of collargolum. Two days later, a section was removed from each spool; but neither was thoroughly impregnated with the silver, as shown by the failure to darken in the centre on exposure to light. The corollary to this fact was revealed by later experiments: namely, that two days' immersion in the silver solution was insufficient to sterilize the catgut in all cases. Sections removed four days later were found to be thoroughly impregnated. A couple of strands removed at this time were left lying on the laboratory desk, exposed to the dust and air, until used for subsequent experiments some weeks later. On the twelfth day the spools were removed from the collargolum solution, washed in running water, and placed in a covered glass dish. This was clean but not sterilized. No precaution was taken in handling the spools to prevent contamination.

This test failed to reveal any advantage to be derived from the preliminary soaking in ether. The non-etherized catgut absorbed the silver solution quite as readily as the other; and in all subsequent tests the preliminary immersion in ether was omitted.

It was eleven days before any further tests were begun. On that day several short strands of catgut were removed from the non-etherized spool without any aseptic precautions. Two were placed in two bouillon tubes, and three in an agar tube. The spool was then placed in 95 per cent. alcohol. After twenty minutes, a piece was removed from the spool under aseptic precautions, washed in water, and divided into five parts; three of these were placed in three bouillon tubes; and the other two in an agar tube. At the same time one of

the pieces that had been left lying on the desk exposed to the dust and air, but likewise to the direct sunlight, was cut in two, and one-half placed in a bouillon tube and the other half in an agar tube. All were then placed in the incubator at 37°. Of the nine tubes thus prepared, eight showed no sign of growth at the end of a month. One bouillon tube containing a section which had been removed without any aseptic precautions, showed slight growth at the end of the second day.

The spool from which the preceding tests were made, was allowed to remain in the 95 per cent alcohol for two weeks. It was then removed and left lying on the laboratory desk. On the next day six short strands were cut off without aseptic precautions and placed in an agar tube. On the following day one strand showed growth at the tip end. Growth continued slowly from this point during the succeeding two weeks that the culture was observed. The other five strands remained sterile.

After lying on the desk for three days the spool was soaked in alcohol for an hour and dried in the air for fifteen minutes. Sections were then placed in a bouillon tube and in an agar tube under aseptic precautions. Both tubes thus prepared remained sterile at the end of ten days.

For the purpose of making comparative tests, a spool of sterilized catgut was obtained from the operating room, and under all aseptic precautions sections were cut off and placed in three bouillon tubes and in an agar tube. Two short pieces were then cut off the same spool drawn through unsterilized hands, and placed in two bouillon tubes. Sections of non-sterilized catgut were likewise placed in three bouillon and in an agar tube. On this same morning, Dr. L. S. Pilcher cut off two pieces from a strand of plain sterilized catgut, and two from a strand of chromic catgut that he was using during an operation, and dropped these into four culture tubes, two of bouillon and two of agar. A piece of silverized catgut which had been lying on the desk for five weeks was likewise dropped into a bouillon tube and all fifteen tubes placed in the incubator.

On the following day all three tubes containing the non-sterilized catgut showed heavy growth; so also did the two tubes containing the sterilized catgut that had been handled. Two of the tubes containing supposedly sterile catgut showed moderately heavy growth, the other two slight growth. The two agar tubes containing the sterilized catgut and the one containing non-sterilized catgut also showed beginning growth. Both the bouillon and agar tubes containing the chromicized catgut failed to show evidence of growth, and this remained true a week later. The tube which contained the silverized strand failed to show growth on the following day; but on the fourth day there was slight growth. Evidently the amount of silver present was insufficient to prevent all growth after such prolonged exposure to contamination.

Convinced by these tests that the silver solution was not only capable of sterilizing catgut, but also that it was capable of exerting a very marked inhibitory effect on the growth of bacteria adhering to the surface as a result of subsequent infection, our next tests were directed to the determination of the length of time necessary to ensure complete sterilization.

Before describing these experiments, a couple of points should be noted in reference to the preceding tests. All the silverized strands tested proved to be sterile except three. Of these three, one had been exposed to dust and air for weeks; and the other two had been cut off the sterilized spool with unsterilized scissors. The single test made on the chromic catgut showed it to be sterile. The six tubes containing supposedly sterile catgut all showed growth on the succeeding day. The corollary to this fact was discovered in a severe case of infection following suture for ununited fracture, and investigation showed that the catgut used at the operation and for the tests was from the same lot. No detailed investigation was made of the nature of the infection in the catgut, but from stab gelatine cultures and microscopic examination we concluded that we had present the staphylococcus aureus and albus, and an undetermined variety of bacillus.

During the succeeding weeks numerous tests of chromic

and plain sterilized catgut were made. The results were practically the same as the preceding. The chromic catgut appeared to be sterile in all cases, the plain sterilized was frequently infected. The plain sterilized catgut has been prepared by boiling in alcohol after the method of Fowler.

On May 27, strands of heavy, medium, and fine catgut were wound on separate spools and placed in a 2 per cent collargolum solution. They were removed at varying intervals and tested as follows:

(1) May 29. Sections were removed from each spool, washed in running water from the boiler, immersed in alcohol for five minutes, dried in the air, and dropped into tubes of bouillon. On the next day no growth was apparent. On the following day there was growth in the tube containing the medium catgut. On the second day thereafter there was heavy growth in this same tube. At the end of two weeks there was no growth observable in either of the other two tubes.

(2) Sections removed from the collargolum at the same time, and treated in the same manner as the preceding, except that they were left in the alcohol twenty hours. At the end of the second day, the tube containing the medium catgut showed slight growth. The other two tubes remained clear at the end of two weeks.

(3) May 30. Sections of catgut were removed from each spool, washed in hot tap water and placed in alcohol.

(4) May 31. Sections removed from the spools and treated as the preceding.

(5) June 2. Sections prepared as the preceding.

Owing to a delay in obtaining culture media, it was ten days before these sections were placed in bouillon tubes. But as cold alcohol is insufficient to sterilize catgut, this delay could not have materially modified the result. All the tubes thus prepared remained sterile at the end of two weeks.

(6) June 5. Sections were removed from the spool of medium catgut, washed in tap water, and left in the covered glass dish for a week. They were then handled by Dr. Pilcher, without his having sterilized his hands, and were then placed

in three bouillon tubes. On the second day there was slight cloudiness in one of the tubes; but it did not increase. The silver present had apparently checked the further growth. At the end of two weeks all three tubes were perfectly clear.

(7) June 5. A strand of sterilized catgut was obtained from the operating room and handled as the preceding. It was then divided into three pieces and these were placed in three bouillon tubes. On the third day thereafter, two tubes had become cloudy, and the third contained a flocculent precipitate. At the end of a week, growth had increased slightly in all. At the end of two weeks, two tubes were very cloudy; the third contained a heavy precipitate.

The results of these tests may be thus briefly summarized: Perfect sterilization was sometimes achieved after two days' immersion in the silver solution, and always after three days' immersion. Catgut thus prepared showed a very marked resistance to subsequent infection, and, likewise, a marked inhibitory influence upon the growth of bacteria introduced with it into the bouillon solutions. This inhibitory influence was much less marked in the agar tubes. To obtain it, a partial dissolving out of the silver appears necessary, and this is exactly what occurs both in the bouillon tubes and in the tissues.

Encouraged by the favorable outcome of these experiments, our next step was to employ silverized catgut at an operation.

Several spools of medium-sized catgut were placed in a 2 per cent. collargolum solution, and left for five days. They were then washed in sterile water, dried for a few minutes in the air, and then placed in 95 per cent. alcohol. A couple of days later, catgut from these spools was used as the ligature and suture material at an operation for removal of tubercular glands of the neck. Two agar and two bouillon tubes were prepared from short sections cut from ends remaining after tying the ligatures.

Recovery after the operation was prompt and uneventful. The wound showed no sign of irritation and healed by primary

intention All four tubes containing the samples of catgut employed at the operation remained sterile after the lapse of ten days

During the next week, the silver catgut was only used in selected cases, mainly those involving superficial operations Since then, in the service of Dr Pilcher, it has entirely replaced the plain sterilized catgut, for all purposes for which the latter is commonly employed

During the earlier portion of this period, the silver catgut was repeatedly tested but always found sterile

Numerous tests were made as to the most suitable strength of the collargolum solution, and as to whether the same solution could be used twice in succession We found that after the first time the silver became precipitated, so that it no longer impregnated the catgut quickly and evenly It is therefore advisable to place the maximum amount of catgut in the minimum of solution but it must be rolled upon the spools before being placed in the solution

For a time it was noted that the catgut when removed from the spool was a trifle soft and hard to thread whereas a few minutes later it would be hard and almost wiry The cause of this was found to be an error in technic The catgut as it comes out of the collargolum solution is quite as soft as after soaking in plain water In order to dry it it is necessary to expose it to the air until the silver is deposited as a metallic sheen If placed in the alcohol too soon this change does not occur until it is once more exposed to the air as at operation

It was my purpose to make a number of tests of the relative tensile strengths of plain sterilized chromic and silverized catgut but my investigations were interrupted after only one test had been made This test was as follows Strands of chromic silverized and plain sterilized catgut of medium size were each divided into two pieces marked A and B The ends of each piece were tied together separately making six loops The loops were then placed on spools, and the tensile strength noted The result thus found is that of two strands



or double that of one strand. In every case the knots were so placed that they did not receive the full force of the strain. The point at which A broke having been noted, the broken ends were tied, and the piece again tested. The point at which the strand broke having again been noted, the longer piece was again tied in a loop, placed in water for fifteen minutes, and again tested. The strands marked B were immersed in water for thirty minutes and then tested. The results may be summarized as follows:

## CHROMIC.

Aa broke at (knot) 19 pounds  
 Ab broke at.....22 pounds  
 Ac broke at.....18 pounds  
 B broke at.....14 pounds

## SILVERIZED.

Aa broke at.....20 pounds  
 Ab broke at.....20 pounds  
 Ac broke at.....16 pounds  
 B broke at.....13 pounds

## PLAIN STERILIZED.

Aa broke at.....20 pounds  
 Ab broke at.....18 pounds  
 Ac broke at..... 9 pounds  
 B broke at..... 9 pounds

In other words, the silverized catgut appeared to be slightly stronger than the plain sterilized catgut, and slightly weaker than the chromic catgut. After immersion in water for fifteen minutes, the chromic catgut lost about 14 per cent., the silver catgut 20 per cent., and the plain sterilized catgut about 50 per cent. of the tensile strength. After thirty minutes' immersion in water, the chromic catgut had lost 33 per cent., the silverized 35 per cent., and the plain catgut 50 per cent. of the original tensile strength.

Although this single test fails to prove anything, it nevertheless corroborates the clinical evidence which shows that the silverized catgut is but little if any inferior to the chromic catgut in tensile strength and resisting qualities, and is very markedly superior to plain sterilized catgut in both these qualities.

In the preparation of the catgut for use, the method employed is as follows: Four coils of catgut, each containing ten strands, are wound on four glass slabs, and placed in a jar

containing a 2 per cent solution of collargolum. They remain in this about a week, the jars being shaken once or twice in the interval. The slabs are then removed, washed in sterile water until the excess of collargolum solution is removed, and placed in 95 per cent alcohol for fifteen to thirty minutes. After this the separate strands are wound on separate spools under aseptic precautions and preserved in 95 per cent alcohol until used. Four coils are employed as the unit, as they exactly fill the jar containing the collargolum solution, and as many jars are prepared at any one time as may be necessary.

[NOTE BY DR. PILCHER.—Since the demonstration by Dr. Blake of the reliable qualities of silver preparation in rendering catgut not only aseptic, but also to a certain degree antiseptic wherever buried in a tissue, it has been used in all cases in my operative work at the Seney Methodist Episcopal Hospital, amounting in number to more than 500 operations, and has continued to give me abundant satisfaction and to justify clinically all the expectations which the laboratory experiments of Dr. Blake had suggested.]

During this period there has been a notable absence of infective accidents in an active general service which has included nearly every variety of operative interference. Silverized catgut has become established as a permanent factor in our operating room methods.

The method of preparation is simple and reliable, and may be commended to a further trial by surgeons.

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## NOTE ON GONORRHOEAL OSTEOMYELITIS \*

BY R C CUPLER, M D,

CHICAGO, ILL.

ROBERT G, 20 years of age, a healthy, athletic young man. His previous history is unimportant. March 4, 1905, he consulted with me concerning his recently acquired acute gonorrhoeal urethritis. March 12, his posterior urethra became infected. He complained of a desire to micturate every few minutes. The straining to pass a few drops was accompanied with intense pain. Between these attacks he had sharp, lancinating pains through the deep urethra extending up the rectum. He had painful erections without erotic incitation. Hematuria more frequent and of greater volume than I had ever seen. The right testicle became swollen. Constipation, headache, marked mental depression, loss of weight and appreciable fever were present. April 5, his left shoulder became severely painful. During the following days he had slight remissions from pain always worse at night. He described this nocturnal pain as that of worms moving in the bone. Temperature 99 to 102, pulse 90 to 100 both fluctuating during the progress of the affection. April 9 the joint was now slightly swollen and motion was not very painful. Dr F J Ehrman saw the patient on this date. The diagnosis of acute gonorrhoeal arthritis was suggested. Paracentesis of the joint gave about 20 c c of fluid, cultures and smears from this showed gonococci, no other organism present.

This procedure gave the patient no relief from the agonizing pain. The following day I opened the joint. It contained a few c c of fluid, the head of the humerus had a cavity with necrotic bone. Smears from here showed a biscuit shaped diplococci in the protoplasm of the leucocyte and negative to Gram's stain.

To recapitulate. The patient was in his fifth week of acute gonorrhoeal urethritis, his swollen, congested, eroded urethral

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\* Read at a meeting of the Douglas Park Branch of the Chicago Medical Society September 3 1906

mucous membrane afforded an ideal opportunity for the entrance of bacteria into the circulation. He had pain, directed to the upper end of the humerus, mainly nocturnal, boring, not relieved after the puncture or local treatment of the joint. Associated with an elevation of temperature, operation showed the roughened bone end of osteomyelitis. Relief followed only after bone curettage. Examination of the fluid and smears from the bone cavity gave biscuit-shaped diplococci which did not take the iodine stain. Therefore, I can come to no other conclusion than that the patient had osteomyelitis with the accompanying perforation into the joint and a secondary omarthritis, and that this infection was of gonorrhœal nature. I have failed to find another case reported.

Many organisms are capable of causing ostitis. Among those that are infrequent in the causation are *B. influenza*, *B. coli communis* and one reported by Litman. This organism, the *B. halo septicum* of Wyas, had its primary focus in a foetid purulent bronchitis.

Lexter says, osteomyelitis is an embolic process. The emboli are usually clumps of bacteria alone. If large they enter the diaphyseal artery; if small they enter and plug the epiphyseal and metaphyseal arteries, causing a wedge shape infarct. The bone marrow contains microorganisms in most all acute infections. They may live there for years and produce no symptoms. Frankel found staphylococci in the bone marrow in 9 out of 13 cases of laryngeal diphtheria. Staphylococci is the most common secondary invader found in this disease. In scarlet fever streptococci were found in 9 out of 13 cases in the bone marrow. Da Costa reports the finding of gonococci in bone from resection of a joint for gonorrhœal arthritis.

Burkhardt says, acute osteomyelitis with accompanied suppurating arthritis is nearly always fatal. Three times more males than females have osteomyelitis. It is more common between 10 and 17 years. I believe the blood supply has its relation here. Sometimes pyogenic bacteria are carried from one end of the bone to the other without involvement of the intervening shaft.

This case demonstrates that gonorrhœal bone infection is of about the same in its toxic effect as gonorrhœal infection is elsewhere. The common staphylococci ostitis shows more pronounced constitutional and toxic symptoms. Bone infection should be considered in the diagnosis of painful gonorrhœal arthritis.

# TRANSACTIONS

## OF THE

### NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, October 10, 1906.*

The President, DR. GEORGE WOOLSEY, in the Chair.

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#### STAB-WOUND OF THE KIDNEY.

DR. ALEXANDER B. JOHNSON presented a man, 39 years old, who was admitted to hospital on September 4, 1906. The history he gave was that he had just had a misunderstanding with some Italian laborers, one of whom had stabbed him in the right side of the back with the stiletto-like blade of an ordinary jack-knife.

Upon inspection, a stab-wound was found on the right side posteriorly, between the eleventh and twelfth ribs. The external wound did not bleed at all, and the patient, while he felt somewhat weak, complained of little or no pain. Thirty minutes after admission he passed, *per urethram*, three ounces of pure bright blood, which led to the diagnosis of a stab-wound involving the pelvis of the right kidney. On the following morning the kidney was exposed through a transverse incision made just below the border of the twelfth rib, disclosing a retro-peritoneal hæmatoma of considerable size. Upon separating the kidney from its surrounding connections, a stab-wound of its posterior surface near the outer border was found. This was three-quarters of an inch in length, about the same size as the external wound. There were no indications that the pleural cavity was involved. The wound of the kidney, which bled freely, was closed by a single mattress suture of catgut, and a small drain was inserted. The hæmorrhage was checked immediately, and the urine cleared up with the exception of a few blood cells. When the kidney was exposed, a good-sized instrument could be passed entirely through the organ, and into the pelvis and ureter. The subsequent history of the case was uneventful, the man making a rapid and complete recovery.

SOME CONGENITAL ANOMALIES OF THE KIDNEY  
AND URETER

DR ALEXANDER B JOHNSON read a paper with the above title

DR GEORGE S HUNTINGTON said that the subject presented by Dr Johnson also carried a great deal of inherent interest from an anatomic point of view, and the speaker said that he *had personally devoted much time to anomalies of the genito urinary apparatus*. He hardly felt able to enter into a discussion of the surgical aspects of the question, and would limit himself to a brief reference to the multiple blood supply of the kidney, especially its arterial branches which depended on the migration of the kidney from the primary inception of the organ in the Wolffian body, which was exceedingly vascular, and upon the fact that in its course of development it could tap the mesonephron at any point. It was on this account that the superabundant and not infrequent anomalous blood supply of the kidney could be explained.

DR GEORGE E BREWER said that in an examination of 150 subjects he had met with six cases of double ureter. In one of these the double ureters were complete and one of them communicated with a kidney segment which was the seat of tuberculous infiltration, while the remaining kidney substance and the opposite kidney were entirely free from disease. Dr Bransford Lewis of St. Louis recently reported a very obstinate case of gonorrhoeal infection of the kidney in which upon cystoscopic examination, he found two ureteral orifices on one side. From one he obtained perfectly normal urine, while from the other the urine was purulent. The case proved to be one of gonorrhoeal pyelitis affecting one segment of the kidney only.

Dr Brewer said that in his investigations of vascular anomalies of the kidney he was surprised at the high percentage of cases in which such anomalies existed and he recalled one instance in which there were five distinct renal arteries. In about thirty per cent of the cases there was a separate and distinct, although comparatively small artery, leading to the anterior surface of the kidney.

DR GEORGE WOOLSEY said that the vascular anomalies that were not infrequently observed in the dissecting room were of interest alike to the anatomist and the surgeon. Both venous



and arterial anomalies were comparatively common. He referred to a case reported by Dr. Robert F. Weir a number of years ago, in which the life of the patient was endangered by a severe hæmorrhage from the accidental tearing of an anomalous renal vein. He also referred to a case similar to the one mentioned by Dr. Johnson, in which the patient had only a single kidney and died of uræmia after its removal.

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*Stated Meeting, October 24, 1906.*

The President, DR. GEORGE WOOLSEY, in the Chair.

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#### SUTURE OF THE ILIOFEMORAL VEIN FOR STAB-WOUND.

DR. CHARLES H. PECK presented a man, 21 years old, who was stabbed in the left groin with a large bread knife during a street altercation early in the morning of September 5, 1906. He was carried into a saloon, where the ambulance surgeon found him lying in a pool of blood and almost exsanguinated. Pad pressure was applied to the wound and he was hurried to the hospital. A saline infusion was given, during the course of which active venous bleeding recurred, which required continuous digital pressure over tight gauze packing in order to control it.

When the patient was taken to the operating room and anæsthetized, it was found that the stab-wound had severed Poupart's ligament over the line of the great vein. The wound was enlarged obliquely upward and outward, and vertically downward. The femoral vein was exposed below the wound, and a temporary ligature placed around it. The peritoneum of the iliac fossa was pushed upward until the external iliac vein was exposed above, and a similar ligature was passed around it. The deep circumflex iliac and deep epigastric veins were then ligated to control the hæmorrhage, which the temporary ligatures on the great vein had failed to check. Inspection showed that the wound in the vein was from one-half to two-thirds of an inch in length; it involved the anterior wall only, and was exactly in its longitudinal axis. It was directly beneath Poupart's ligament, chiefly in the terminal portion of the external iliac vein. The open mouths of the deep epigastric and

deep circumflex iliac could be seen through the wound. Digital pressure directly over the wound in the vein was maintained by the House Surgeon, Dr Coerr, until the temporary ligatures on the main vein were in place, and the tributaries tied off.

The wound in the vein was then closed with a through and through continuous suture of No 00 chromic gut, which checked the hæmorrhage completely. This was reinforced by another layer through sheath and overlying tissues, and the temporary ligatures were removed. Poupart's ligament and the deep muscles were sutured with chromic gut. The wound was then closed with catgut and silk excepting at the lower angle, where a cigarette drain was placed. A long posterior splint was applied, and the limb elevated. The pulse was scarcely perceptible at one stage of the operation and an infusion containing adrenalin was given on the table. Time of operation fifty six minutes. The patient rallied promptly from the shock and there was no further hæmorrhage, and no venous congestion nor coldness or œdema of the limb at any time. The patient's temperature ranged below 100.4°, and his pulse between 80 and 90 for the first three days after the operation and after that never rose above 99.8, excepting once on the twelfth day, when it reached 100. The dressings were changed on the third day, when the wound appeared clean, and the drain was removed. At the next dressing on the seventh day rather extensive supuration in the subcutaneous fat was discovered. This delayed the healing of the wound, but did not involve the deeper structures nor interfere with the healing of the wound in the vein. It was undoubtedly due to contamination of the original stab-wound, which it had been impossible to cleanse properly on account of the free bleeding. The limb was kept immobilized on a long splint for about two weeks. The patient was allowed out of bed on the twenty-fourth day, and left the hospital thirty days after the injury. The wound was practically healed with the exception of a small granulating area.

#### PARTIAL GASTRECTOMY FOR CARCINOMA

DR CHAS H PECK presented a man 66 years old, who was referred to him by Dr Walter A Bastedo and was operated on at Roosevelt Hospital on July 13 1906. He gave a history of stomach trouble dating back more than five years, with gradu-

ally increasing loss of flesh and strength, and vomiting, especially for the past two or three years. A mass could be felt in the region of the pylorus, and stomach peristalsis was visible through the skin.

Under ether anæsthesia, a vertical incision, five inches long, was made three-quarters of an inch to the right of the median line. About one-third of the stomach was occupied by an indurated mass, the center of which was on the anterior wall, two or three inches to the left of the pylorus. The lumen of the stomach was much constricted at this point, scarcely admitting the little finger through the rigid walled orifice. The pylorus itself was not involved. The stomach to the left of the obstruction was dilated, and its muscular coat much hypertrophied. The mass was not adherent to the surrounding structures, but the glands at both curvatures were enlarged. The first portion of the duodenum was divided with the thermo-cautery between clamps, about one inch below the pylorus. The cut end of the distal portion was closed with a continuous suture of heavy catgut, through all its coats, before removing the clamp, and then inverted with a purse-string suture of heavy silk. The lesser omentum was ligated in segments, and divided near the liver; the gastric artery was ligated near the cardiac end of the stomach. The stomach was then turned to the left, and the greater omentum ligated in segments below the line of the glands, as far as the middle of the greater curvature. The gastro-epiploica sinistra was then ligated, and the stomach divided between two long clamps, the excised portion including all of the lesser and about one-half of the greater curvature. The cut end of the stomach was closed with a heavy catgut lock-stitch suture before removal of the clamp. This was buried by a continuous catgut Lembert suture, and a third tier, of heavy silk, was placed in the same manner. A posterior gastroenterostomy was then performed with a Murphy button, Weir-flange, protected by interrupted silk Lembert stitches. The anastomosis was made in the first three inches of the jejunum. The edges of the slit in the transverse mesocolon were attached to the stomach by a few catgut stitches. A cigarette drain was inserted to the stump of the duodenum, and the abdominal wall closed by layers with catgut, chromic gut, silk-worm gut and silk. Time of operation, one hour and a quarter. The patient rallied nicely

from shock. A low rectal saline irrigation was given every six hours. Small quantities of sterile water were given by the mouth after twelve hours, and peptonized milk on the third day. There was no vomiting after the operation and scarcely any nausea. The temperature barely reached 100° after the second day and the pulse rate was slightly above the normal. The patient's convalescence was uneventful. The button was never recovered in the stools, but as an X-ray picture taken before he left the hospital was negative, and he has had no symptoms suggesting its retention, its passage was undoubtedly overlooked. He was allowed out of bed on the twelfth day, and left the hospital eight days later. He was then eating a variety of solid food without discomfort. He has had no nausea or vomiting since the operation, and no distress after eating. He has gained about 30 pounds in weight since the operation.

The pathological report of the specimen was carcinoma probably developing on the base of an old ulcer.

DR WILLY MEYER, in speaking of the methods of securing the cut end of the duodenum in cases where the carcinoma involves the greater part of the superior horizontal portion of the same, referred to the following procedure which he had applied in three of his cases with excellent results. After the division and closure of the duodenum by the usual method he considered it very wise as an additional precaution to stitch the head of the pancreas over it by a few interrupted sutures. If an omental flap can be drawn on top, one is still more secured against leakage from the stump. Under such conditions the insertion of a cigarette drain is superfluous. He has always closed the abdomen in his cases without drainage.

Dr Meyer did not find his method mentioned in the extended discussion which recently appeared in the *Centralblatt für Chirurgie* on this subject or elsewhere in literature and therefore thought it worth while to mention it here.

DR FRED KAMMERER said he had followed this method of reinforcing the sutured end of the duodenum mentioned by Dr Meyer in two cases, quite a number of years ago. Both cases had done well and leakage from the duodenum was prevented. No doubt this method had suggested itself to other surgeons also.

## PERICARDITIS TREATED BY DRAINAGE.

DR. OTTO G. T. KILIANI presented a man of 22 who was admitted to the German Hospital in 1901 for an attack of acute articular rheumatism, complicated by endo- and pericarditis. There was a large pericardial effusion which at one time became so threatening that it required immediate incision of the pericardium. Drainage of the pericardial sac was continued for seven days, after which the oozing ceased. Immediately upon incision, the patient, who had been practically moribund, showed signs of improvement, and his further recovery was uneventful. He had remained well up to the present time, a period of about five years.

## BALL-VALVE TUMOR OF THE STOMACH.

DR. CHARLES L. GIBSON presented a man of 62, who was operated on at St. Luke's Hospital three weeks ago for the relief of gastric symptoms of some years duration, and consisting chiefly of a progressive loss of flesh and strength. An examination of the stomach contents, as well as the objective signs, led to a probable diagnosis of carcinoma.

Upon opening the stomach, a tumor as large as a good-sized cherry was found. It was attached to a pedicle about an inch and a half long, which sprang from just inside the pylorus. This tumor had apparently intermittently plugged the pylorus, thus giving rise to pyloric obstruction. The patient made a rapid recovery, and had since remained absolutely free from symptoms. The pathologist reported that the mass was polypoid in character.

DR. JOSEPH A. BLAKE said that in a somewhat similar case upon which he operated about four years ago, the tumor proved to be an adenoma. It was pedunculated, and at times caused symptoms of obstruction by being swept into the pyloric orifice. The speaker thought that most of these polypoid growths of the stomach were adenomatous in character.

## SARCOMA OF FEMUR TREATED BY MIXED TOXINS.

DR. W. B. COLEY showed the following cases of sarcoma of the femur treated with the mixed toxins of erysipelas and bacillus prodigiosus:

CASE I.—E. R. F., 16 years old. *Giant-celled Sarcoma of*

*the Lower End of the Femur* of central origin and rapid growth. The patient was admitted to Dr Gibney's service at the Hospital for Ruptured and Crippled on April 2 1906 with a history that three months before she had first noticed pain on the inside of the left knee on walking. One month later she began to have slight tenderness in this region and a hard swelling appeared. This rapidly increased in size and very soon lameness developed. At the time of admission to the hospital April 2 1906 the patient's general condition was good and she was able to walk without apparatus but had a decided limp. Just above the internal condyle of the left femur there was considerable enlargement apparently of bony origin. The tumor did not connect with the cavity of the joint but over the central portion deep palpation elicited a sense of fluctuation. The skin over the swelling was normal. Measurements of the thigh showed 1 inch atrophy of the affected side and  $1\frac{1}{4}$  in increase in size over the swelling just above the left knee.

The diagnosis in this case was difficult and was settled by an exploratory operation by Drs Gibney and Coley on April 6 1906. A  $2\frac{1}{2}$  in incision over the swelling on the inside of the thigh showed a fluctuating tumor which on aspiration was found to contain bloody serum. An incision was made into the tumor and a considerable quantity of blood and serum evacuated. The cavity itself was the size of a small egg and occupied the central portion of the femur. The tumor was exceedingly vascular and hæmorrhage was stopped by gauze packing. The blood count was practically normal.

The specimen was examined by Dr Jeffries pathologist of the hospital who pronounced it giant celled sarcoma. It was thought worth while to try the mixed toxins for a few weeks in the hope of saving the limb from amputation. The toxins were begun on April 9 and continued for about a month in doses sufficient to cause a moderate reaction.

At first there was decided improvement in the leg as shown by a decrease of nearly 1 inch in size. Very soon thereafter however the toxins apparently lost their effect and the tumor began to rapidly increase in size. After consultation by Drs Gibney Bull and Coley it was decided to amputate below the trochanter rather than at the hip joint. This was done on May 18 by Dr Coley 4 inches below the trochanter. The patient

though suffering a good deal of shock, made a good recovery, the wound healing by primary union. The toxins were resumed as a prophylactic, on June 9, since which time she has had 32 injections into the other thigh and into the stump of the amputated leg.

Her weight on June 12, just after the beginning of the toxins, after amputation, was  $77\frac{3}{4}$  pounds. She increased from  $\frac{1}{4}$  to 2 pounds a week steadily and at the present time, October 24, weighs  $91\frac{3}{4}$  lbs. The patient is in perfect health and there is no evidence of a return either in the stump or any other portion of the body.

CASE II.—S. D., female, 18 years old. *Mixed-celled Sarcoma of the Lower End of the Right Femur*, of central origin. No trauma. The patient was admitted to Dr. Gibney's service at the Hospital for Ruptured and Crippled on March 29, 1906, with the following history: One year ago she first noticed pain in the right knee, which was first treated for rheumatism. The pain continued until August, 1905, when a plaster of Paris splint was applied at St. Luke's Hospital, the condition being at that time regarded as of tuberculous origin. The treatment was continued for about seven months, the splint having been removed six weeks before she entered the Hospital for Ruptured and Crippled. The last two months she had been confined to bed and was very much emaciated and extremely weak. The right knee presented a fusiform swelling just above the joint. Measurements (just above the joint) showed a circumference of 15 ins. on the right side,  $11\frac{1}{4}$  on the left. The knee itself was acutely tender and any motion painful. X-ray photograph showed the lower 6 inches of the femur nearly twice the normal thickness. The clinical condition seemed clearly tubercular osteitis and Dr. Gibney decided to excise the joint. A semi-lunar incision was made through the ligamentous patella. The joint when exposed was found in perfectly healthy condition, while the femur above the joint was much thickened and presented three softened, purplish areas. These softened areas were curetted and a large quantity of disorganized cheesy material removed. The lower end of the femur was almost entirely disorganized, shaft and condyles being connected only by three narrow bridges of bone. The material removed closely resembled that of tubercular tissue, but the microscopical report stated

it to be mixed celled sarcoma. The blood count showed Red cells 3,560,000 hæmoglobin 85 per cent.

After the diagnosis of sarcoma had been established the patient was referred to Dr. Coley by Dr. Gibney for amputation. This was done 4 inches below the trochanter on April 7, 1906. The patient suffered little shock and made an uninterrupted recovery, the wound healing by primary union. She was put upon the mixed toxins on April 26 and the injections were given every other day. The patient showed a very rapid increase in weight, rising from 69 pounds on June 12 to 90 pounds on October 24. In August both patients were sent to the country for two weeks during which time the toxins were remitted. Both patients will leave the hospital to-morrow and the toxins will be discontinued for a few weeks at least.

These cases of course are entirely too recent to be claimed as permanent results and they were shown by Dr. Coley for the purpose of illustrating his recent change of view as to the proper method of treating sarcoma of the femur. Up to two or three years ago he strongly believed in amputation at the hip joint for this condition. In six of eight hip joint amputations which he performed for sarcoma without mortality the patients showed no permanent recovery. Five had a recurrence within six months of the operation and the sixth case could not be traced.

Of 68 cases collected from the literature by Butlin in which hip joint or high amputation was done for sarcoma of the femur only one patient is known to have remained well over three years.

Dr. Coley stated that he had been able to find seven cases of sarcoma of the femur in this country in which the patient has lived beyond three years. In three of these seven cases success was undoubtedly due to the mixed toxins of erysipelas and bacillus prodigiosus. In a fourth case an osteosarcoma of the femur in which hip joint or high amputation was done by Dr. Bull at the New York Hospital 16 years ago a very severe streptococcic infection of the stump followed the amputation. The patient recovered and was well when last heard from sixteen years later. In this case there is reason to believe that the infection had much to do with preventing a recurrence. In one case the sarcoma was situated in the upper portion of the femur causing spontaneous fracture. The disease was so far advanced that in the opinion of Dr. Gerster of Mt. Sinai Hospital



there was no hope from hip-joint amputation and the patient was sent to the Montefiore Home for Incurables. He received prolonged treatment with the mixed toxins with the result that the tumor entirely disappeared and the bone re-united. The patient was in perfect health more than four years after treatment. In this case the microscopical examination, made by Dr. Mandlebaum, pathologist of the Mt. Sinai Hospital, and confirmed by Prof. J. N. Prudden of Columbia University, showed the growth to be giant-celled sarcoma.

CASE III.—Dr. Coley then showed a case of extensive *round-celled sarcoma of the left femur*, in which he had strongly advised hip-joint amputation in February, 1902, but neither the patient nor his family would consent to the sacrifice of the limb. The patient was then put upon the X-ray treatment from February until December, and while there was unmistakable decrease in the size of the tumor of the femur, extensive metastases developed in the pectoral and lumbar regions in December 1902. A highly vascular mass developed under the left pectoral muscle, the size of a hand, which was partially removed by operation. The tumor in the lumbar region extended from the anterior superior spine up to the ribs, apparently of about the size of a child's head. The patient was then put upon the mixed toxins of erysipelas and the treatment was continued with intervals of rest, for the greater part of the next year. In a few weeks the lumbar tumor softened and became necrotic. An opening was made posteriorly and large masses of tumor material were drained away. At the present time there is no evidence of any sarcoma either in the lumbar or pectoral region and subsequent curettings have shown no sarcomatous elements in the femur. There still remains a chronic thickening of the femur, which has not, however, increased in nearly four years. The patient's general health is good.

The results in these six patients, together with those previously referred to, have led Dr. Coley to believe that the most rational treatment of sarcoma of the femur at the present time, when situated in the usual locality, namely, the lower end, is a brief preliminary trial with the toxins. If no marked improvement is evident at the end of a month, amputation below the trochanter should then be done, leaving sufficient stump to enable the patient to comfortably wear a false leg; followed by

prolonged use of the toxins immediately after wound healing in the hope of preventing a recurrence

Dr Coley finally showed a fourth patient, with inoperable *round-celled sarcoma of the spine*, well nearly five years after treatment with the toxins

CASE IV—D G, male, 20 years old Diagnosis confirmed by Dr H Brooks, pathologist of the Bellevue Hospital The tumor was of enormous size, involving the lower dorsal and upper lumbar vertebræ The patient had lost about fifty pounds in weight, and there was so much pressure upon the spinal cord that there was total paralysis of the lower extremities bladder and rectum, and he was so weak that he was unable to turn over in bed Seen in consultation with Dr V P Gibney, of the Montefiore Home, in February, 1902 The mixed toxins of erysipelas and bacillus prodigiosus were begun and continued by the house staff under Dr Coley's direction daily injections were given up to the following May and severe reactions, temperature of  $103^{\circ}$  to  $104^{\circ}$ , followed most of the injections Patient began to show improvement, local as well as general, almost at once By September he was able to get out on crutches In November he was shown before the New York Surgical Society by Dr John Rogers At that time he had regained nearly his normal weight and got about very well with the aid of a cane In February, 1903, one year after treatment, he was able to walk perfectly well without support of any kind, and his general health had become perfect He was able to resume his former occupation

Dr Coley stated that he considered this to be the most remarkable result ever obtained from the use of the toxins Fortunately, there can be no doubt as to the diagnosis since the tumor was not only examined by well known pathologists but specimens of the tumor have been preserved He has shown this patient before various medical societies the past two years The patient remains in perfect health, nearly five years after treatment

DR JOHN ROGERS said that one of the patients shown by Dr Coley, the young man with the tumor on the back, had been under his care for several months The growth was a massive one, involving the region now occupied by the scar, and showed every clinical evidence of sarcoma The disappearance of the growth under the use of the mixed toxins was certainly very

remarkable. The speaker asked Dr. Coley what percentage of recoveries in sarcoma he had met with by the use of the mixed toxins.

DR. COLEY said that he could not answer Dr. Roger's question accurately without referring to his records. Furthermore, it would depend somewhat on the type of sarcoma. Originally, he was inclined to believe that the best results from the use of the toxins were observed in sarcoma of the spindle-celled variety, and very poor in the round-celled type. In recent years, however, he had been obliged to change his opinion in that respect, as many cases of round-celled sarcoma had been successfully treated by the toxins. Speaking offhand, he could positively say that he had observed from ten to fifteen per cent. of permanent cures following the use of the toxins, and in that connection, the fact should not be lost sight of that he only recommended the treatment in hopeless cases that were inoperable, with this one exception, namely, in sarcoma of the extremities, where an amputation of the limb would otherwise be imperative. In such cases he believed it justifiable to try the toxins for three or four weeks before sacrificing the limb. Up to the present time Dr. Coley had collected 12 cases (four personal and eight cases of other men) in which the arm or leg had been saved and eight of these patients were alive and well more than three years afterwards.

DR. ALEXANDER B. JOHNSON said he had under his observation a woman, about 35 years old, who had suffered from recurrent sarcomatous growths in various regions of the body. According to her history, her first sarcoma appeared when she was about a year old, and since that time she had submitted to at least fifteen operations for the removal of these growths. Personally, Dr. Johnson said, he had operated on her four times, and he knew of several other surgeons who had operated on her three, four or five times. The regions involved have been the breast, the lumbar and gluteal regions, the groin, etc. At the present time she had a sarcomatous mass in the abdomen, which he had found it impossible to thoroughly remove in spite of a very far-reaching dissection. He asked Dr. Coley whether, in his opinion, the mixed toxins were indicated in such a case.

DR. COLEY replied that under ordinary circumstances the use of the toxins would not be indicated under such conditions.

Still, he recalled cases equally hopeless, apparently which had recovered under their use. The treatment required a thorough trial in order to prove or disprove its efficacy. In some cases it effected a marvelous recovery, while in others it was useless. In those cases where improvement occurred it was apparently due to the systemic effect of the toxins, and not to their local action. In a case of extensive cancerous involvement of the mesentery which was referred to him by Dr. Willy Meyer about twelve years ago, the patient had recovered entirely under the use of the toxins. He had since remained well, and had recently married. In the spinal case he had shown, the patient had received no treatment since 1902.

## EPIDURAL HÆMORRHAGE

DR. ALEXANDER B. JOHNSON presented a boy 19 years old, a native of Austria, and a tailor by occupation.

His past history was that he had suffered from occasional frontal headaches, which sometimes incapacitated him for work for half a day at a time. It was alleged by his friends that his mouth had always been drawn to the right and that the left cheek was flattened, even when at rest. There was no history of epilepsy nor of venereal disease. The boy's habits were good.

On the morning of September 27, 1906, at 10 o'clock he was knocked to the ground from a low wagon. He was able, unassisted, he said, to reach his home a few blocks away and walked up two flights of stairs. He at once complained of headache, and laid down. An hour later he vomited some food and a little blood, at the same time losing consciousness, and remaining in that state until six P. M. He vomited every time he turned his head, but there was no further vomiting of blood. There was no bleeding from the mouth, throat or ears. At six P. M. he recovered consciousness, and remained conscious for four hours, during which interval he vomited several times. An ice bag applied to the head gave no relief to the headache. Leeches applied behind both ears made him feel weaker, but relieved the headache slightly. At this time he said he could not hear from the right ear. At ten P. M. he again became unconscious and continued to vomit on moving his head.

The following morning he was stuporous but could be aroused, he would obey directions and even respond to ques-

tions at times. He still complained of headache, which was general in character, but most severe above the right mastoid region. He said it hurt him to see with the right eye and that there was still loss of hearing on the right side. He complained of no pain, save that in the head. The vomiting persisted. His friends state that his mouth was drawn to the right, but no more so than before the accident; that he was able to frown on both sides, to close both eyes tightly, and to move all his extremities. He had occasional slight twitchings, general in character.

The patient was brought to the New York Hospital in a carriage at 10.30 A. M. on September 28. Upon admission, he was stuporous, and could be roused with difficulty sufficiently to do simple things, such as opening the eyes or protrude the tongue, or briefly reply to questions. His eyes were closed; his expression apathetic, when not disturbed, yet he was very irritable, resenting any examination by turning about. The head showed no evidence of any injury. There was tenderness to percussion in the posterior temporal and mastoid regions on the right side; no change in the percussion note. The mouth was drawn to the right side; the left side of the mouth and left cheek were flaccid; the tongue was slightly coated and deviated a trifle to the left. No bleeding from the mouth, nose or ears. The forehead, in frowning, wrinkled only on the right side. Both eyes could be tightly closed, the right more so than the left. The right pupil was somewhat dilated, and failed to react to light. The opposite pupil reacted normally. There was no subconjunctival ecchymosis. On account of the patient's condition, it was impossible to test his sight.

Heart normal; pulse, 64, regular, slight increase in tension. Lungs and abdominal organs negative. The patient at times moved the extremities, and the right hand was occasionally carried behind the right ear, especially after pressure over that region. During most of the time the extremities were limp, dropping when raised. There were no evidences of paralysis. No loss of pain sensation. Fibrillary twitchings over the entire body at times, most marked over the left pectoral muscles and the left cheek. All the reflexes were present; the supraorbital was much more marked on the right side.

At two P. M. on the day of admission, the patient was very stuporous and could not be roused in the slightest degree.

Temperature, 99°, pulse, 64, respirations 18. An immediate operation was deemed advisable and was performed by Dr. Johnson at 3 30 P M.

*Operation*—An inverted U shaped incision was made over the posterior part of the right temporal region. The scalp showed some ecchymosis. Four quarter inch holes were then drilled into the skull, one at each corner of the exposed square. The bone flap was then completed with Hartley's skull saw and the osteotome and hammer. Immediately on turning back the flap, which was about two and a half inches square a large dark blood clot came to view which was easily removed by the fingers and irrigation. It covered an area half as big as an adult palm, and extended for some distance beyond the boundaries of the bone flap. A sharp spicule of bone along the anterior edge of the flap was removed by the rongeur forceps. The brain was markedly compressed by the clot and did not pulsate. There was some arterial bleeding from a point in the dura near the lower part of the exposed area (posterior branch of the middle meningeal) which was controlled by a suture of fine catgut, and there was considerable steady oozing from above and in front of the exposed area the source of which could not be determined, and which continued after temporary packing with gauze. Before the completion of the operation the depressed brain had expanded and begun to pulsate. As the oozing from above still continued a plain gauze drain was packed in between the dura and the skull, and led out at the upper, anterior angle of the bone flap, a piece of bone being removed from that corner of the flap by rongeur forceps to make an opening for it. The osteoplastic flap and the muscles were then carefully replaced, and the edges of the scalp united by sutures of silk.

Shortly after the commencement of anæsthesia the patient's pulse and respirations became very slow, the former falling to 40 per minute, and the respirations to ten. With the opening of the skull however, the pulse became more frequent, and almost normal, then, for a brief period the pulse became weak and irregular, but its quality soon improved without stimulation and the patient left the table in good condition. At 8 30 P M, on the day of the operation the patient was conscious. He was able to answer questions intelligently and said that his

headache was much relieved. The tongue did not deviate. On the following day he was much improved, and the sight of the right eye was apparently good. There was no paralysis, excepting of the face. There was no loss of sensation; reflexes marked. On the third day, when the dressings were changed, the patient said he could hear perfectly well on the right side. His further convalescence was uninterrupted, and he left the hospital, entirely well, on October 15.

#### BILATERAL ANKYLOSIS OF TEMPORO-MAXILLARY JOINT.

DR. JOHN A. HARTWELL presented a girl of 17, who had an attack of diphtheria when five years old, and at that time it was first noticed that upon attempts to examine her throat, she was unable to open her mouth widely. The parents state that when she was three years old she fell and struck her chin, receiving a cut lip. It was not known that she received any injury to the jaw itself or whether this had any bearing upon the subsequent ankylosis of the jaw.

When the patient came under Dr. Hartwell's observation, last April, there was almost complete immobilization of the lower jaw. When she was asked to open her jaws to the extreme limit, the distance between the upper and lower incisors measured three-eighths of an inch, and she was unable to protrude the lower jaw beyond the upper one. An X-ray picture which was taken failed to show the cause of the obstruction, which was supposed to be due to an ankylosis of the temporo-maxillary joint.

Upon making an incision, Dr. Hartwell said he came down upon a bony mass which was firmly adherent to the zygoma above, and to the outer surface of the ramus below. Its attachment to the ramus was very firm, while to the zygoma it was attached by a band of fibrous tissue. With the chisel and rongeur the attachments were freed, first on one side and then on the other, until the articulation became perfectly normal. The operation was done about two months ago, and the patient was now able to open her jaws to the full extent.

Dr. Hartwell said he could give no cause for the bilateral ankylosis in this case. It was apparently not congenital, and so far as he knew, was unique.

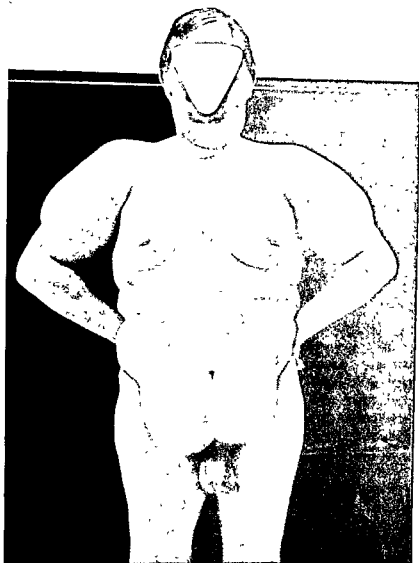


FIG. 1—Multiple symmetrical lipoma



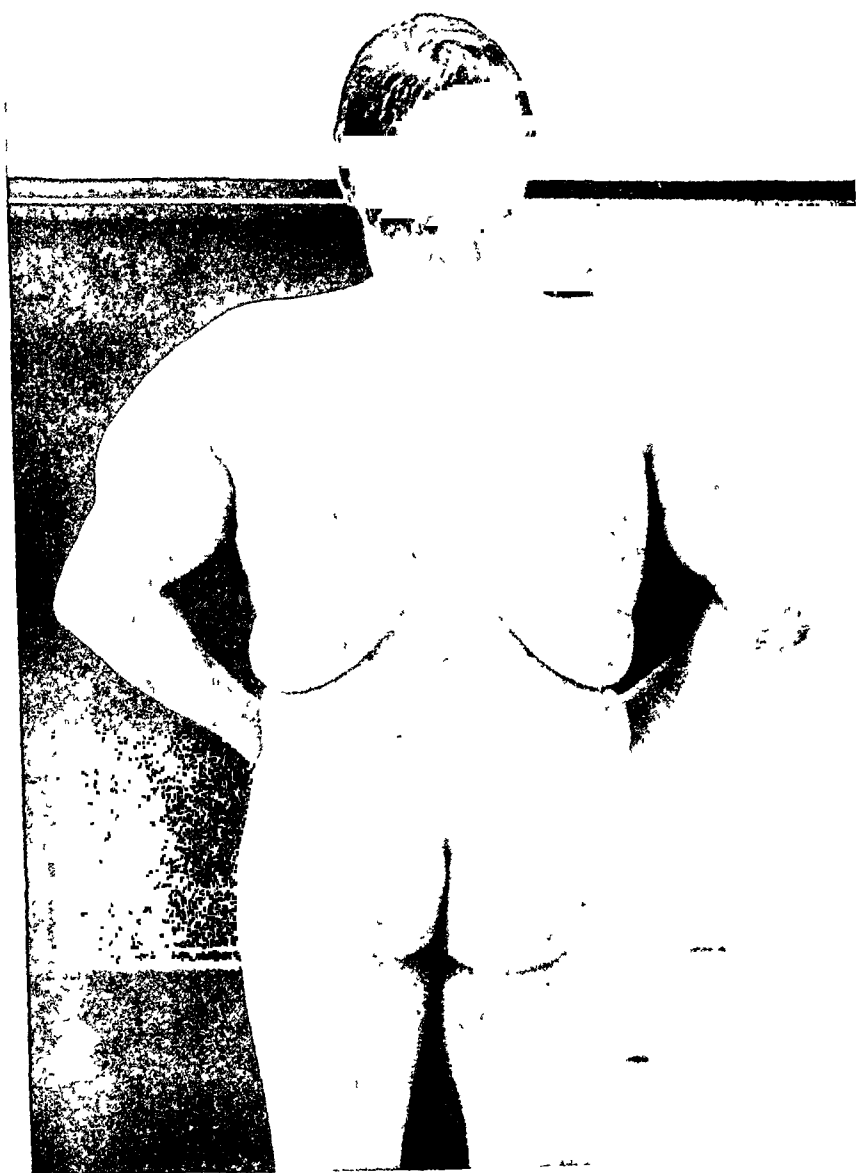


FIG 2—Multiple symmetrical lipoma

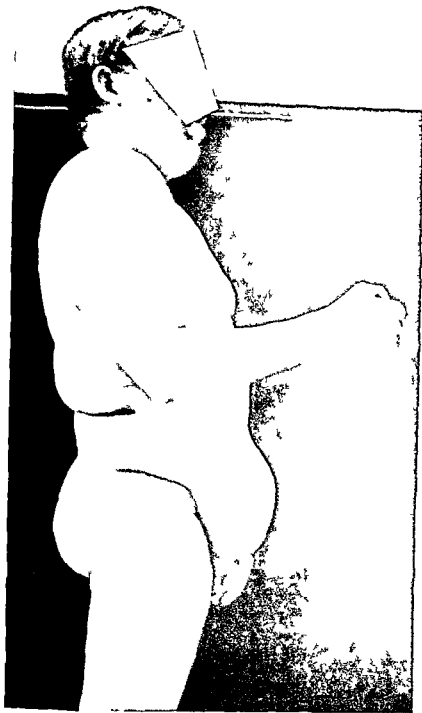


Fig. 3 — Multiple symmetrical poma



TYPHOID WITH DOUBLE PERFORATION OF THE ILEUM AND  
PERFORATION OF THE GALL-BLADDER INTESTINAL  
SUTURES CHOLECYSTECTOMY DEATH TWENTY  
ONE DAYS AFTER OPERATION AUTOPSY

DR OTTO G T KILIANI read a paper with the above title for which see page 34

DR WOOLSEY said that it was extremely doubtful whether the diagnosis of perforation of the gall bladder could have been made under the conditions indicated without opening the abdomen. He could recall a number of cases of cholecystitis developing in the course of typhoid fever but they were all of a comparatively mild character and the symptoms gradually subsided. In such cases a recurrence with stone formation was not infrequent. Dr Kiliani's case was certainly both unique and interesting.

DR KAMMERER mentioned a case in which septic temperature developed after typhoid fever had run its course. A swelling in the region of the gall bladder finally indicated the seat of trouble and upon opening the abdomen an acutely distended gall bladder was found. Incision of the same revealed several gall stones and some seropurulent fluid from which typhoid bacilli were easily cultivated. The gall bladder was otherwise normal and the case healed under drainage and the patient finally recovered after a very long illness.

MULTIPLE SYMMETRICAL LIPOMA

DR KILIANI showed a number of photographs of this case (See Figs 1 2 and 3). The patient was a man 49 years old. His family history was good. He was markedly alcoholic denied venereal disease. Four or five years ago he first noticed the appearance of these symmetrical lipomatous swellings which gradually involved the face shoulders abdomen thighs etc. Dr Kiliani said that at the request of the patient he had extirpated two of these swellings in front of the ears on account of the disfiguration they had given rise to.

DR KAMMERER referred to two cases of symmetrical lipoma which he had observed almost ten years ago and in which a marked diminution in the size of the tumors followed the use of thyroid extract.

DR. WOOLSEY said he saw a case during the past year in which the lipomatous masses occupied the axillæ and both sides of the neck and were somewhat painful. The growths in this case were in a woman who was operated on for gall-bladder disease.

DR. KILIANI, in closing the discussion, said the type of cases of which he had shown photographs was entirely different from that in which the tumors apparently followed the course of certain nerves.

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*Stated Meeting, November 14, 1906.*

The President, DR. GEORGE WOOLSEY in the Chair.

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#### SUBCUTANEOUS RUPTURE OF POPLITEAL ARTERY AND VEIN.

DR. BENJAMIN T. TILTON presented a boy 17 years old, who on June 27, 1906, was seated on the rear end of a large truck, with his legs hanging over the end. The truck was on the car-track and started to leave it in order to allow a car that was following to pass by. The motorman of the car did not allow the driver sufficient time to get off the track, and collided with the rear end of the truck, the car striking the boy a blow on the flexed knee, and forcing the back of the knee against the tail-board of the truck. The boy complained of great pain in the popliteal space, and was unable to walk. He was brought to Bellevue Hospital by ambulance.

Upon admission, the physical examination showed a slight abrasion on the front and outer side of the knee below the patella. The knee was held in a slightly flexed position. There was a fulness in the popliteal space. There was no ecchymosis, and the knee-joint contained no blood. There was no tenderness in front, but posteriorly there was marked tenderness in the popliteal space. Extension of the knee was impossible on account of the pain. There were evidences of loss of circulation in the foot and leg.

On the following day the swelling in the popliteal space had increased, extending further up and down the leg. There was a slight yellow discoloration in the calf. Absence of pulsation in the leg and foot persisted. On the following day an

operation was undertaken to relieve the pressure of the increasing hæmatoma which was causing the patient great pain, and to determine the condition of the popliteal vessels

An Esmarch bandage was applied, and an incision made in the popliteal space. A fair amount of clotted blood was evacuated, and it was found upon inspection that both the artery and vein were completely severed, the two ends of each being separated fully an inch. There were thrombi in the proximal ends. As consent for amputation had not been obtained the artery and vein were ligated proximally and distally, and the wound partially sutured. It was noted that the amount of hæmatoma seemed small in relation to the size of the vessels which had been completely ruptured.

The pain in the leg continued, and signs of beginning gangrene of the moist variety showed themselves. The temperature rose gradually to  $105^{\circ}$ , and there was evidently no chance of saving any part of the leg, which had now become infected. On account of the threatening sepsis a Gritti amputation was performed on July 10, thirteen days after the injury. There was not sufficient healthy skin tissue behind to permit of approximation with the anterior flap, consequently, the wound was left open, posteriorly, and packed. No infection occurred, in spite of the close proximity of the amputation to the gangrenous areas. The sawn surface of the patella united promptly with that of the femur.

The granulating surface behind was finally covered by skin grafts a few weeks after the amputation and a good stump resulted. The case was interesting, Dr Tilton said, First, on account of the rarity of this particular injury, Secondly, because of the question of the mechanism that produced it, Thirdly, because of the very slight accompanying injury of the skin and soft parts, and, Fourthly, the question of possible suture of the divided artery and vein.

DR L W HOTCHKISS said that he had had one case similar to the one presented by Dr Tilton. The patient's leg was caught between the buffers of two cars. There was a comminuted fracture of the lower end of the femur, slightly compounded, which was treated in the usual way, as the full extent of the injury was not at first recognized. Rapidly developing gangrene of the foot led to an incision over the popliteal space.

which revealed a complete rupture of the artery, the two ends of the vessel being widely separated. Amputation of the leg was followed by recovery. In this case he thought the question of arterio-venous anastomosis was out of the question.

DR. FRANK W. MURRAY said that some years ago, at the old Chambers' Street Hospital, he saw a sailor who had met with a similar accident while paying out rope on a tugboat. His leg was caught in a coil of the rope, and he received a very severe wrench in the region of the knee. When he was brought to the hospital there were no signs of a fracture; there was some laceration of the skin, and a slight hæmatoma in the popliteal region, with exquisite pain, and entire absence of pulsation in the anterior and posterior tibials. On the following day the condition being practically unchanged, the popliteal space was explored, and a complete rupture of the popliteal artery and vein was found, and though the ends of the severed artery were curled up, the condition of the ends of the severed vessels, together with the laceration of the surrounding tissues did not allow of any attempt at an end-to-end suture, so amputation at the knee was performed.

DR. HOWARD LILIENTHAL, in reply to a question as to whether a suture of the vessels would have been feasible in a case like the one reported by Dr. Tilton, said he had had no personal experience with injuries of that character. If suture of the vessels was resorted to in such a case, it would have to be done after the manner demonstrated by Carrel, which he would subsequently describe in his paper.

#### RESECTION OF THE ANKLE FOR TUBERCULOSIS.

DR. WALTON MARTIN presented a girl, ten years old, who was admitted to the Roosevelt Hospital January 19, 1906, in the service of Dr. Blake.

For the past two years she had been suffering from tuberculosis of the right ankle. The ankle was much swollen; she was unable to walk on account of the pain, and there was a discharging sinus near the inner malleolus. The X-ray showed a focus of diseased bone in the lower end of the tibia, near the epiphyseal cartilage.

Conservative treatment was carried out for three months. The sinus was curetted, the joint immobilized, and the child

was kept for the greater part of the day in the fresh air. During this period, Dr Norman E Ditman treated the child with injections of tuberculin. The tuberculo-opsonic index was 5 on February 17, on April 6 the index was 15. Notwithstanding the joint after a period of temporary improvement became worse. The pain increased and the swelling extended to the region of the external malleolus.

On May 4, 1906, the joint was resected. The ends of the tibia and fibula were sawn across and the astragalus removed. The diseased capsule was dissected out, the old sinus curetted and drainage tubes were introduced in the lateral incisions. The temperature reached normal twenty one days after the operation. The old sinus and the drainage openings closed gradually, and the child was discharged from the hospital cured early in July. She passed the following two months at Sea Breeze, Coney Island. At present she is in good health, has a movable ankle and can walk without pain or discomfort.

DR HOTCHKISS said he saw the patient in the Hospital early last summer, and again after her return from Sea Breeze, and had been struck by the remarkable improvement in her condition.

DR JOSEPH A BLAKE who had also seen the patient said that for a time her condition was regarded as very precarious. The improvement in her appearance, to which Dr Hotchkiss had referred, was so marked that one would scarcely recognize her as the same person.

SMALL ROUND CELLED SARCOMA OF THE NECK AND TONSIL  
ENTIRE DISAPPEARANCE IN SEVEN WEEKS UNDER  
TREATMENT WITH THE MIXED TOXINS OF ERY  
SIPELAS AND BACILLUS PRODIGIOSUS

DR WILLIAM B COLEY presented a man, 32 years of age, who had already been shown by him at the January, 1906, meeting of the Society. His family history was good. The patient had been referred to him on October 17, 1905, by Dr Arpad G Gerster as an inoperable case of recurrent, small round celled sarcoma. The following history was obtained.

About the middle of August, 1905, the patient noticed a swelling on the left side of the neck, just behind the sternomastoid muscle. At about the same time he also noticed an



enlargement of his left tonsil; there was no pain at first, but as both tumors increased rapidly in size, they soon became painful. In the latter part of August, 1905, the patient was operated upon at St. Mark's Hospital by Dr. Carl Beck, who made an attempt to remove the tonsil tumor, as well as that of the neck. He found it impossible, however, to make a complete excision. The patient was immediately put upon the X-ray treatment every other day, and also received radium treatment externally and internally; the latter, however, had little if any influence in checking the rapid growth of the tumor. On October 13, while under the care of Dr. Goldwater, at the New York Polyclinic, a portion of the tonsil tumor was removed and examined by Dr. F. M. Jeffries, Director of the Pathological Laboratory of the New York Polyclinic, and also by the Pathologist of the Practitioners' Laboratory, both of whom reported the tumor to be a small round-celled sarcoma.

On October 17, when Dr. Coley first saw the patient, a physical examination showed the following condition: The left side of the neck was occupied by a globular tumor, about the size of half an orange; it extended from the angle of the jaw in front to the mastoid process behind, and downwards nearly to the clavicle. Its consistence was about the same as that ordinarily found in round-celled sarcoma; the skin was not adherent. Examination of the left tonsil showed that it was enlarged to two or three times its normal size. The patient's general health had been but little affected. He was admitted to the General Memorial Hospital on October 17, 1905, and immediately put upon the mixed toxins of erysipelas and prodigiosus, without any other treatment. Daily injections were given, alternating, one day into the tumor direct; the other, into the pectoral region. The highest dose given was seven minims; his temperature ranged between 99.5 and 103. In less than a week there was a decided decrease in the size of the tumor, and an increase in mobility. The diminution continued steadily, until, at the end of six weeks, both the cervical and tonsil tumor had apparently entirely disappeared. He left the hospital at the end of seven weeks, and although there were no visible remains of the tumor, the toxins had been kept up twice a week in the pectoral region as a prophylactic against further recurrence.

Dr. Coley said it was interesting to note in connection

with this case that the toxins, which were prepared by Dr B H Buxton, of the Loomis Laboratory, were eight months old

Dr HOWARD LILIENTHAL asked Dr Coley what proportion of cases of sarcoma treated by the mixed toxins were apparently cured Also, whether he had noted that metastases might occur in spite of the use of the toxins In this connection, Dr. Lilienthal said, he wished to report the probable final history of a patient whom he had shown on two occasions to the members of the Surgical Society The patient was a young girl with a sarcoma of the scapula, this was removed, and she made an excellent recovery. There was, however, a slight local recurrence, which disappeared under the use of Coley's fluid She then remained well for a period of almost two years Recently she returned with a recurrence in the mastoid of the corresponding side After that had been operated on by Dr Charles A Elsberg, and removed quite radically, there was a further recurrence in the lung, and the patient was now rapidly failing and in an apparently hopeless condition

Dr Lilienthal said that while the final result in this case had been extremely disappointing to him, there were enough cases on record in which the mixed toxins had produced a complete and apparently permanent cure to make it well worth while to make use of the remedy

Dr COLEY, in reply to Dr Lilienthal, said that speaking approximately, the mixed toxins had produced an apparent cure in from ten to fifteen per cent of the cases that he had treated personally When it is remembered that these were all inoperable, hopeless cases, the results are encouraging The speaker said that *formerly* he had limited the use of the toxins to inoperable cases, but now he was becoming more strongly in favor of employing the remedy, as Dr Lilienthal has suggested, as a prophylactic measure He recalled one case, where, seven years ago, he had removed a small periosteal tumor of the finger, which was regarded as benign Sections of the growth were submitted to Dr Welch, of Baltimore, and two pathologists in this city, and all three pronounced it a small round celled periosteal sarcoma The advisability of amputating the finger then came up, but as the patient strongly objected to such a radical measure, the toxins were used as a prophylactic This was seven years ago, and thus far there had been no signs of a recurrence.

Dr. Coley said he could recall about 20 cases in which toxins had been used as a prophylactic measure. A very large number of these patients were still well. He knew of others where they apparently had no effect on the progress of the disease. The only thing to do was to test them. He said he was confident that they did not cause metastases, and the case which he showed at a last meeting of the Society, a sarcoma of the femur, periosteal round-celled, with an enormous metastatic growth on the back and one in the pectoral region disappeared under the use of the toxins. And the patient was well four years proved that the toxin may be successfully used, even with extensive metastases. The action of the toxins is systemic, not local.

#### SARCOMA OF THE INGUINAL GLANDS, SIMULATING HODG-KIN'S DISEASE.

DR. COLEY presented a man, 37 years of age, who was admitted to the General Memorial Hospital on August 24, 1906, having been referred by Dr. A. G. Gerster as a case of inoperable sarcoma. Family history negative. The patient stated that he had always been in good health. Three years ago, he first noticed a small swelling in the right groin. This grew slowly until it reached the size of a walnut; was never painful and general health remained perfect. Five months prior to his admission the lumps in the groin began to increase in number and to grow rapidly in size. They finally interfered with his walking.

Physical examination at the time of his entrance to the hospital showed heart and lungs normal. His right inguinal region is occupied by a number of independent tumors, more or less closely fused and extending deeply into the iliac fossa. The skin over the growths was freely movable. The right thigh and leg were considerably swollen. Inasmuch as the tumor mass seemed so unusually movable, it seemed wise to attempt removal. This was done by Dr. Downes on Sept. 4, 1906. An incision, 9 ins. long, was made from the anterior superior spine, passing over the middle of Poupart's ligament and down along the course of the femoral vessels and a very large number of nodules, varying in size from a marble to a lemon, all more or less completely surrounded by a capsule, were removed. The peritoneum was opened accidentally in one place and closed with catgut sutures. The wound healed

satisfactorily without suppuration. Microscopical examination of the growth made by Dr Clark assistant pathologist of the hospital and confirmed by Dr Wood of the College of Physicians and Surgeons laboratory pronounced it Hodgkin's disease. Portions of the tumor were also examined at Cornell laboratory and the same diagnosis was made.

Blood examination on May 7 showed Red cells 4 200 000 white cells 51 000 polymorphous 35 per cent lymphocytes 65 per cent hæmoglobin 80 per cent.

After the wound had healed the nucleo proteid serum from a case of Hodgkin's disease prepared by Dr S P Beebe from the Huntington Laboratory Fund for Cancer Research was begun. Nine tubes of 15 cc each were given without apparent effect. Oct 16 the serum was given up and the patient was put upon the mixed toxins of erysipelas and bacillus prodigiosus. Up to the present time 19 injections have been given in doses of  $\frac{1}{2}$  mm to 13 mm at the present. On October 16 the right thigh measured  $18\frac{1}{4}$  inches being two inches larger than the left. Physical examination at that time showed the right inguinal and iliac regions occupied by a tumor which apparently infiltrated the adjacent structures as its limits could not be well defined. In the right hypochondriac region just to the right of the median line there was a hard mass evidently attached to the spine and extending from the median line nearly over to the lumbar region and up almost to a level with the right costal arch. No enlargement of the spleen and liver could be detected. During the past month under the toxin treatment there has been some improvement in the abdominal condition the tumor in the iliac fossa is somewhat smaller and the mass in the right hypochondrium is not nearly so pronounced. Measurements of the leg remain the same.

The principal reason for showing this case he said is that it emphasizes very clearly the striking similarity between Hodgkin's disease and sarcoma.

This case together with a number of others somewhat similar which had come under his observation had strengthened the opinion he had long held that Hodgkin's disease is really a variety of sarcoma rather than an independent disease.

DR GEORGE E BREWER said he had now under treatment a case almost identical with the one shown by Dr Coley. The

patient had a large glandular tumor in the groin, sections of which had been removed and pronounced Hodgkin's disease. The accessory glands in other parts of the body were also enlarged. In a similar case observed last spring, the serum treatment was very satisfactory.

DR. ANDREW J. MCCOSH said he was inclined to agree with Dr. Coley that Hodgkin's disease resembled sarcoma far more than it did tuberculosis. He had recently operated for the third time on a middle-aged man who had enlarged glands in the neck and other parts of the body. The first operation was done about four years ago, at which time he removed a large number of glands which the pathologist declared to be lymphosarcoma. Eighteen months ago a second operation was done. A number of glands were again removed, and these were pronounced probably lymphosarcoma. Three weeks ago the third operation was done, and the same pathologist reported that the case was one of Hodgkin's disease, making no mention of lymphosarcoma.

The pathologist's reports in this case, Dr. McCosh said, went to show that either there must be considerable difficulty in distinguishing between the two conditions, or else that the tissues had undergone some change since the date of the previous examinations.

DR. BLAKE reported the case of a woman who had a number of enlarged glands in the neck and axillæ. Those in the neck were removed, and the pathologist pronounced the case one of Hodgkin's disease. Subsequently, some of the axillary glands were removed and were reported tubercular. Later on there was an enlargement over the ribs, and the development of a tubercular sinus connected with the thoracic cavity. Dr. Blake said that when he last saw the patient, she was dying, apparently of Hodgkin's disease.

#### RESECTION OF THE SHOULDER AND ELBOW FOR TUBERCULOSIS.

DR. WILLY MEYER presented a Swedish woman, 32 years old, who had been operated on at Stockholm a number of times for tuberculosis of the right shoulder and right elbow, from which she had suffered since her thirteenth year.

When Dr. Meyer first saw the patient, in October, 1897,

both of the affected joints showed a typical tuberculous inflammation. He first resected the shoulder, (October) and subsequently the elbow, according to the Kocher method (December). The functional result of both operations was excellent. The woman, whose occupation was that of a waitress, had a strong right arm which she could use for all purposes excepting that, she was unable to raise it fully, and that pronation and supination were also slightly impaired. The operations were done nine years ago.

Dr Meyer said he considered the Kocher method of resection far superior to that of Langenbeck. The former gave an excellent exposure of the parts and all the important attachments of the tendons were preserved.

#### END TO END ARTERIOVENOUS ANGEIORRAPHY

Dr HOWARD LILIENTHAL read a paper with the above title, for which see page 1.

Dr BLAKE said that from a theoretical standpoint certain objections to the procedure described by Dr Lilienthal had occurred to him. In the first place the ligation of the femoral vein was dangerous even when the vessels were normal. Again, it seemed to him that when the femoral artery was attached to the vein the blood would take the shortest course back by the anastomotic branches with the superficial abdominal veins and through the veins around the hip joint and not circulate through the terminal veins of the extremity. Another objection would be a production of a pressure stasis throughout the veins of the limb.

Dr JOHN B. WALKER said that during the meeting of the American Medical Association in Boston last June a case was shown at the Boston City Hospital in which the femoral artery and vein had been divided; the upper end of the femoral artery had been sutured to the lower end of the femoral vein; the lower end of the femoral artery had been sutured to the upper end of the femoral vein. Primary union had occurred. The patient suffered from gangrene of the foot.

Dr WILLY MEYER said the case referred to by Dr Walker was probably that of Dr Joshua C. Hubbard of Boston which was operated on in April 1906 and described in the October 1906, issue of the ANNALS OF SURGERY. In Dr Hubbard's case

the patient, who was eighty years old, recovered from the operation, the femoral artery being cut and anastomosed to the vein and the vein divided and sutured to the artery. The procedure failed to check the gangrene. When the leg was amputated, about six weeks later, both the anterior and posterior tibials spurted arterial blood. The veins did not seem to carry arterial blood. The patient left the hospital in good condition.

Dr. Meyer also thought that such operations should be tested in the human subject in suitable cases, but he fears, that gangrene once having set in, can not be checked in this way.

DR. JOHN A. HARTWELL asked Dr Lilienthal whether Dr. Carrel, in his experimental work, had occluded the femoral artery by multiple ligatures, so as to prevent a return of the circulation through that vessel.

DR. LILIENTHAL, in closing the discussion, said he had considered this matter very carefully before he decided to risk the operation in the human subject. In reply to the theoretical objections raised by Dr. Blake, the speaker said that Dr. Carrel had succeeded in producing a complete reversal of the circulation, so that the veins carried arterial blood outwards, and the arteries carried venous blood back again. The blood, in its return course, did not necessarily take the shortest channel back to the heart; at least, that fact had been demonstrated in the normal animal. Whether it was so under pathological conditions, such as he had had to deal with, Dr. Lilienthal said he did not know. In a similar case in the future, if he found the popliteal artery occluded, he did not think he would again venture to operate higher up. Of the conditions he had mentioned in his paper in which the operation was perhaps justifiable, that of aneurysmal gangrene was the most hopeless. If there was a mortality attached to the operation, then, of course, it had no place, and amputation was preferable.

In reply to Dr. Hartwell, Dr. Lilienthal said that Carrel's work had been experimental, and limited to normal animals, and he was quite certain that he had not made any experiments that compared in a fair way with the pathological conditions that were encountered in this case.

## REVIEWS OF BOOKS.

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SURGERY ITS PRINCIPLES AND PRACTISE By Various Authors  
Edited by WILLIAM WILLIAMS KEEN, M D LL D, Pro-  
fessor of the Principles of Surgery and of Clinical Surgery,  
Jefferson Medical College Philadelphia Vol I 8vo pp  
983 W B Saunders Company, Philadelphia, 1906

This is the first of a series of five volumes in which the editor, Professor Keen with the help of more than three score collaborators, has proposed to present surgery as it is understood and practised to day. As one runs over the names of the contributors, from Abbe to Young, if he is at all conversant with the men who are the leaders in the surgical activities and problems of the day, he can but feel that they represent the best which the present generation has produced, and one looks forward with a confident expectation of value and character in the treatise as a whole. The plan of the work and the selection of his collaborators is the fruit of the ripened judgment of the veteran teacher, author and surgeon whose name the work as a whole must bear. It will remain as a fitting monument to his surgical genius and his practical abilities as a man of affairs. May he be spared long to enjoy the fruit of his labors and the applause and affection of his colleagues.

A very few transatlantic names are found in the list of authors. Bland Sutton of London has prepared the chapter on Tumors. His neighbor, Edmund Owen, that on Diseases of the Mouth and Jaws. Mayo Robson, on the Surgery of the Stomach and Moynihan on the Surgery of the Pancreas and Spleen, complete the list of English surgeons that have been drawn upon. From the Continent, Albert Kocher, of Berne, is to deal with the Surgery of the Thyroid Gland and Gottstein, of Breslau, that of the Esophagus. Lannander of Upsala, presents Local Anæsthesia and Anæsthetics. This completes the tale. It is evident that the treatise will be so preponderantly American that it will always be considered as such.

The publishers in their prospectus promise the appearance



of a volume every three months, until the whole work is completed. It is to be hoped that this assurance will be realized in the performance. It will be truly characteristic of cisatlantic energy and push, if it is done. The reviewer in a moment of weakness twenty-seven years ago enrolled himself as a subscriber to the series of volumes to compose the *Deutsche Chirurgie*, "Herausgegeben von Billroth und Luecke." The series is not completed yet! The volumes continue to come to hand from the German publisher at irregular intervals. The title pages now bear the inscription, "Begründet von Billroth und Lecke." Other names have succeeded to the responsibilities of the "Herausgegeben!" Each volume, however, as it has appeared has been complete and encyclopædic up to the date of its publication, and possesses a permanent value as a book of reference, if not as a guide to present practice. It is the latter element, however, which most appeals to the average American practitioner of medicine. He wants something for his present use and immediate practical guidance. In a previous generation Gross was the great teacher who personally dominated as a teacher of surgery, both in the amphitheater and as an author. There was a vigor, a directness, a personality to his great work, the two volumes of his system of surgery, that never failed to engage the interest and confidence of the reader. No subsequent writer has been able to "bend his bow," unless it be Fowler in those volumes which he left behind him as a record of his energy and his enthusiasm.

The last forty years have produced a series of most important and valuable surgical treatises by American authors and from American presses that have in succession well presented the conditions of surgical knowledge and practice of their respective dates: The *International Encyclopædia*, edited by Ashhurst; the system edited by Dennis and Billings; the scholarly volumes of Agnew; the condensed epitomes of Ashhurst, of Roberts, of Wyeth, of Da Costa and of Brewer; the great American text-book edited by Keen and White; the volumes of Park and of Warren, of Wharton and Curtis and of Fowler, together constitute a body of surgical teaching and practice of the highest interest and the greatest credit to the profession of this country. In the rapid development of the surgery of the present, the life of a surgical text-book is necessarily very brief. That publishers, shrewd men of business and

well acquainted with the field from which patronage is to be obtained, should at such short intervals be putting out from their presses such expensive publications as those already mentioned, of the recent past, to be succeeded now by such an one as this "Surgery" edited by Keen, or that which is now disputing with it the favor of the profession, the series edited by Bryant, speaks well for the intelligence and enterprise of the medical men of the country who are to be the buyers of these expensive books, and to whom it is simply requisite that a book should be the best and the latest to secure its purchase whatever its cost.

The introductory chapter in this first volume of Keen's Surgery is by James G. Mumford, of Boston, and is entitled "Narrative of Surgery A Historical Sketch." It is good reading. The style is animated and the descriptions are most interesting. Hippocrates and Galen receive due mention, and then a skip is made over fifteen hundred years to Vesalius. We could wish that this able pen could have said something about the Schools of Salernum, of Bologna, of Montpellier, of such surgeons as Mondeville, de Chauliac, Argelata, Berengarius da Carpi, and that he might have gone a little more into detail as regards the work which the Arabians did, all in this interval between Galen and Vesalius. The hiatus is too great. Our modern surgeons need to be informed as to the development and traditions of their art, and who so well fitted to do it as the accomplished and learned author of this chapter?

The remaining chapters of this volume are devoted, as would be expected, to topics pertaining to the Principles of Surgery and to General Surgery. A good index closes the volume. The merits of the book are such as will make one anxious for the appearance of its successors.

LEWIS S. PILCHER

A TEXT-BOOK OF GENITO-URINARY DISEASES. By DR. LEOPOLD CASPER, Professor in the University of Berlin. Translated and edited with additions, by DR. CHARLES W. BONNEY, of Philadelphia. P. Blakiston's Son & Co., Philadelphia, 1906.

Doctor Leopold Casper, the author of this treatise, is a recognized authority on the subject of genito-urinary diseases. He is without question an enthusiast on the subject, as all those who

have studied under him will acknowledge. He is an indefatigable worker and a logical and scientific thinker. In his clinic in Berlin one sees all classes of genito-urinary diseases. As a teacher he has the art of imparting to his students a clear insight into the subject which he presents.

In his book this same enthusiasm and clearness is very evident. He divides his book into a General and a Special Section. In the General Section are considered the Examination of the Patient, Anatomy and Physiology of the Genito-Urinary Tract, Physical Methods of Examination, and Physical, Chemical and Microscopical Examination of the Secretions. This may seem to be but a repetition of what many other authors have already presented, but when one studies this section carefully he is impressed with the originality and value of the treatise as coming from the pen of a man who has actually done the work, and has excluded many of the worthless and time-consuming methods which other authors still cling to.

The Special Section treats of the various Diseases of the Genito-Urinary Tract and of the Functional Disturbances of the Sexual Organs.

The discussion of radical operations for hypertrophy of the prostate has been written conjointly by the author and Charles W. Bonney, the latter having translated the German edition, and edited the present American edition.

The book is eminently practical, and will rank high among the text-books on Genito-Urinary Diseases.

**SURGICAL ASPECTS OF DIGESTIVE DISORDERS.** By JAMES G. MUMFORD, M.D., Surgeon to the Massachusetts General Hospital, etc., and ARTHUR K. STONE, M.D., Physician to Out Patients, Massachusetts General Hospital, etc. 8vo., pp. 395. The Macmillan Company, 1905.

The era that dawned with the operative treatment of appendicitis, and whose light brightened with the recognition of gall-bladder disease as a surgical affection, has lightened more and more as Moynihan, Robson, the Mayos and others have published their successes in the operative relief of other chronic abdominal conditions, especially those affecting the stomach and intestines. As one turns the pages of the work now under consideration the

conviction grows that the field of the internalist is rapidly being narrowed and that the day of pills and potions is passing

If one were to find nothing more in Professor Mumford's pages than his review of medical history it would sufficiently demonstrate how recent is any real knowledge of diseases of the stomach and how rapidly such knowledge has placed a large proportion of gastric complaints in the list of mechanical disorders that demand for their relief not medicine but the knife. One feels as he reads an enthusiasm that urges him to recommend all his patients to have their abdominal organs repaired and rearranged and it is not until some time has elapsed that sober afterthought raises a question as to whether we are yet sufficiently experienced to see such surgical treatment in its true perspective

This much seems certain. A number of chronic gastric diseases including chronic ulcer dilatation with stagnation gastric tetany and some others are markedly benefited by gastro enterostomy. The pain subsides the nervous symptoms disappear and the patient regains his health and strength

The authors discuss these questions at some length and present a number of statistics from various sources bearing on both sides for and against operation. They instance the frequency with which cancer of the stomach is overlooked dwell on the deplorable inadequacy of late operation for its relief discuss the symptoms and diagnosis somewhat fully and conclude that exploratory laparotomy should be more frequently undertaken

Interesting chapters are devoted to the bile passages and the pancreas. Glenard's disease with the other abdominal ptoses receives intelligent discussion and the appendix comes in for an extended consideration especially chronic appendicitis and the results of operation. A number of interesting records are cited showing how previously unsuspected chronic appendicitis with only mild inflammation and adhesions seemed responsible for a variety of digestive disturbances and how operation gave relief

Dr Henry F. Hewes furnishes an interesting and valuable—because complete and concise—appendix dealing with the diagnosis and significance of gastrectasis of gastric ulcer and cancer and containing the records of a number of gastric cases with clinical and postmortem finding

It is to be regretted that a book so full of excellence should

be somewhat marred by the style in which it is written. The sentences are often involved and there is a frequent abrupt change of subject that demands so close attention on the reader's part as to cause him to occasionally lose the meaning. The importance of the subject and the judicious way in which it is presented, however, more than counterbalance this literary defect and are recommendation enough without reviewer's comment.

HENRY GOODWIN WEBSTER.

ATLAS AND TEXT-BOOK OF HUMAN ANATOMY. Volume I. By PROFESSOR J. SOBOTTA, of Wurzburg. Edited, with additions, by J. PLAYFAIR McMURRICH, A.M., Ph.D., Professor of Anatomy at the University of Michigan, Ann Arbor. Quarto, 258 pages. Philadelphia and London: W. B. SAUNDERS COMPANY, 1906.

Prof. Sobotta's aim in preparing this atlas has been to provide a work which should be practical and not too comprehensive, furnishing illustrations true to nature, and especially adapted to the use of medical students in the dissecting room. It is not an atlas for the finished anatomist, and can not be classed with the more extensive work of Toldt.

In the original German edition, the text and atlas were separate volumes, and in preparing the English edition Prof. McMurrich has united the text and atlas in a common volume. The nomenclature employed is essentially that proposed by the Basel Committee on Anatomical Nomenclature, most of the terms being anglicized. It is entirely different from most text-books of anatomy, in that it is a descriptive atlas.

Volume I treats of the Bones, Ligaments, Joints and Muscles. As might be expected in such a work, the illustrations are the most striking features; multicolor lithography has been extensively employed, and almost the entire myology has been illustrated in this manner. The other illustrations are mostly half-tones, and all of them are accurate and most excellently executed.

It is to be regretted that in the section on Osteology, the illustrations do not indicate the points of attachment of the muscles to the bones. This is always a most puzzling question for the student to solve, and should be considered in compiling such a work. The descriptions, however, of the bones are

clear and comprehensive The sections on Joints and Muscles are beyond criticism The work, as a descriptive atlas, leaves nothing to be desired

PAUL PILCHER

DISEASES OF THE DIGESTIVE SYSTEM Edited by FRANK BILLINGS, M D, 8vo, pp 824 D Appleton & Company, New York, 1906

"Die Deutsche Klinik," edited by Julius L Salinger, M D, is being made available for English readers in the series of volumes on Modern Clinical Medicine, now three in number, of which the present volume is one The list of contributors is perhaps the best critique of its merits Ewald, Boas, Hoppe-Seyler, Nothnagel, Leo, Strauss, Neusser, Rosenheim, Riegel, Hirschfeld, Oser, Minkowski, Stadelmann, Kraus, Fleiner, Vierordt, Strasburger One can add nothing to the authority with which these men speak

The chapters of this work are each complete separate articles contributed by the clinicians mentioned, independent but correlated by the general subject of digestive diseases

If one were to choose from among so many noteworthy contributions, possibly the one by Oser, of Vienna, on the Symptomatology of the Diseases of the Pancreas would first arrest attention, if only on account of the obscurity from which pancreatic diseases and their determination are just emerging Associated as it is with the liver, deeply hidden in the abdomen and so difficult of digital appreciation, it has been long neglected, even in necropsies, while its rapid self-digestion post mortem has helped to obscure its pathology

Recent work on the normal and abnormal constitution of the *fæces* and on the physiology of proteid and hydrocarbon digestion has directed attention to the functions of the pancreas and seems to offer certain points of diagnostic value in the estimation of pancreatic activity Collective reports on the pathology of the organ have demonstrated its relation to some forms of diabetes, so that the analysis of the urine offers some help The conclusions drawn in Oser's article are these Pancreatic disease may be reasonably assumed when examination of the *fæces* shows a disturbance in the digestion of albumin as

evidenced by undigested meat, and insufficient fat digestion, other causes being discounted. The details of the article cannot be considered here.

An exceedingly interesting contribution is that by Riegel on the diagnosis and treatment of gastric dilatation, as is one by Ewald on gastric ulcer and gastric hæmorrhage. The latter modestly points to a personal experience of over 1250 cases. The etiology he declares to be not yet satisfactorily explained, except where direct trauma can be proven. A valuable table comparing the symptoms of nervous gastralgia, ulcer and cancer is included. Under Treatment he advocates in general the method by large doses of bismuth in suspension, appropriate diet and laxative alkaline drinks—as Carlsbad water. Surgical intervention is advocated only after persistent medical efforts have failed, and in selected cases.

The section on the examination of the fæces, by Strasburger, is remarkable for its excellent illustrations—many in color—of normal and abnormal fæcal constituents. Its brevity is compensated for by its lucid presentation.

Fleiner presents an excellent contribution on diarrhœa, intestinal catarrh and intestinal tuberculosis; Boas one on constipation and hæmorrhoids, and Vierördt one on acute diffuse peritonitis, appendicitis and perityphilitis. Space prevents enumeration and discussion of the other articles, all of which are notable.

The work will prove a valuable addition to every working library.

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Conversant with the various schools  
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Observe, then, oh, my darling,  
The kiss resemblance bears  
To the rich osculation  
Of millionaires.

The last kiss—oh, my darling,  
I've had enough of this!  
Hereafter I'm contented with  
Our same old kiss.

—CAROLYN WELLS in *December Lippincott's*.

**EUCAIN LACTATE IN NOSE AND THROAT OPERATIONS.**

By T. J. Harris, M.D., New York, Adjunct Professor of Diseases of the Nose and Throat, Postgraduate Medical School; Assistant Surgeon, Manhattan Eye and Ear Hospital, etc.

Abstracted from *American Medicine*, December 30, 1905.

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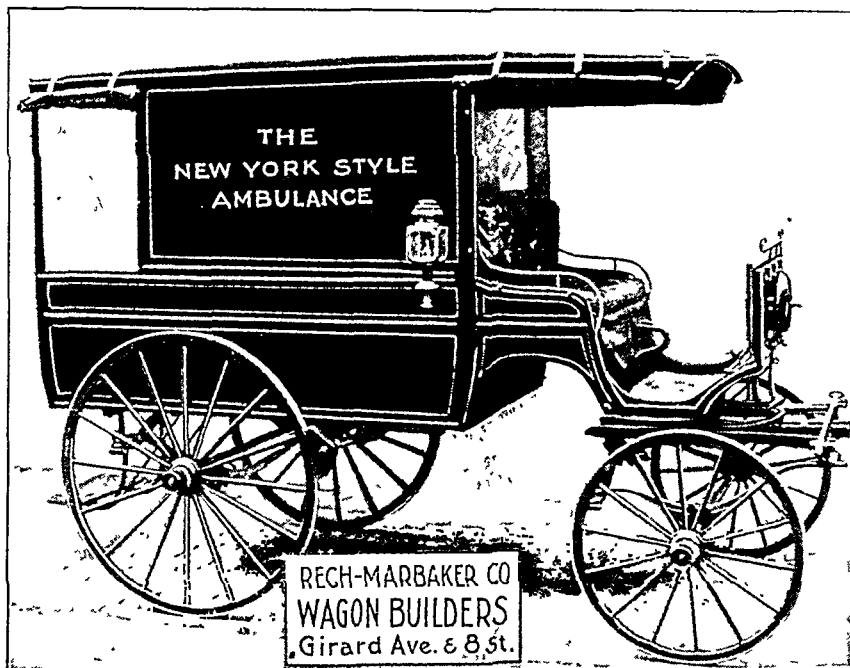
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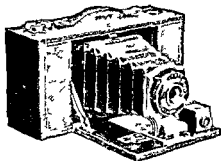
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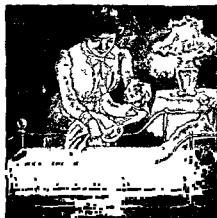
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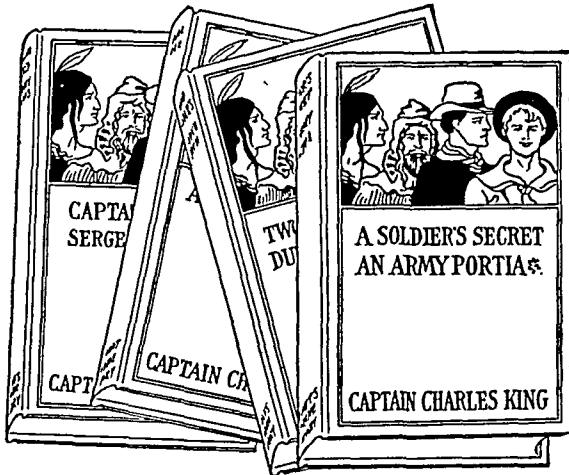
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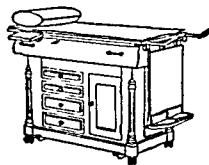
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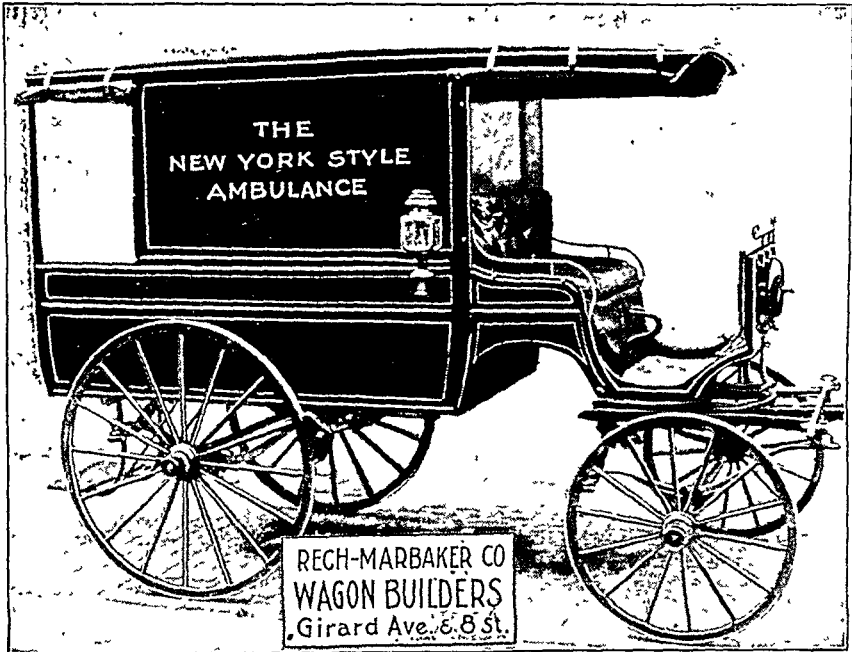
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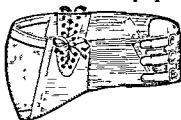
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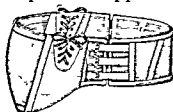
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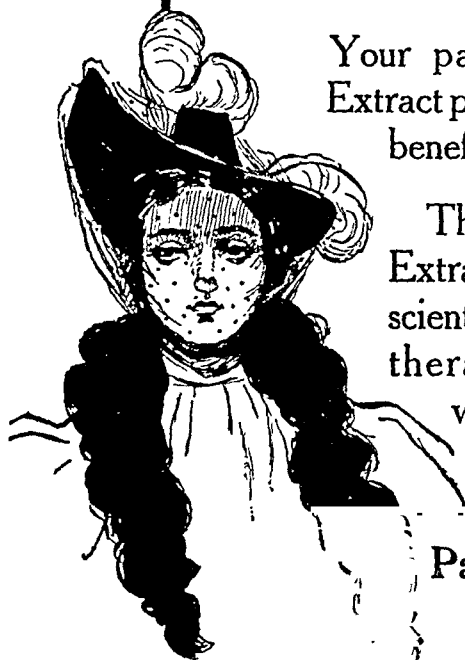
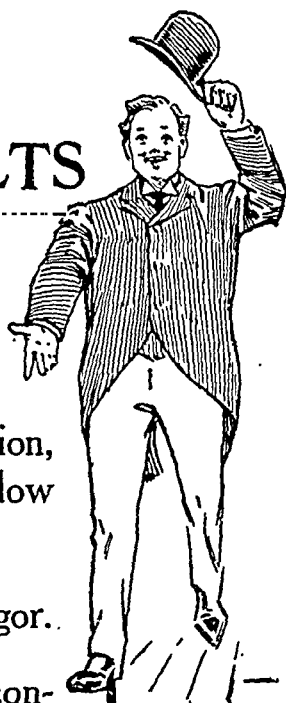
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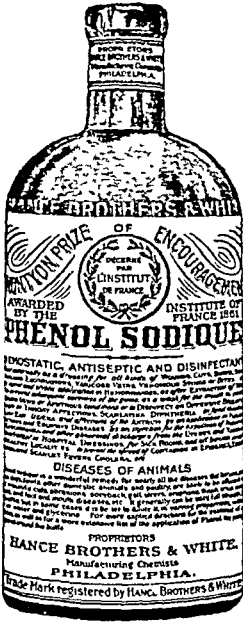
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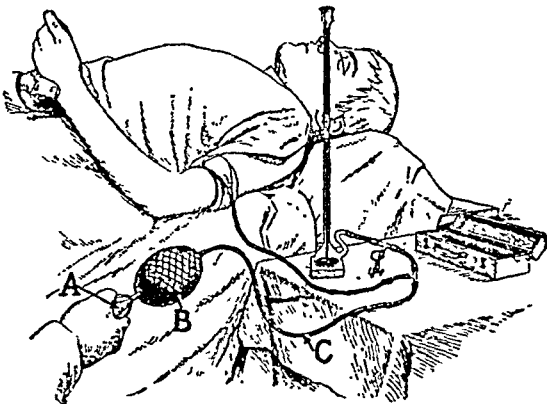
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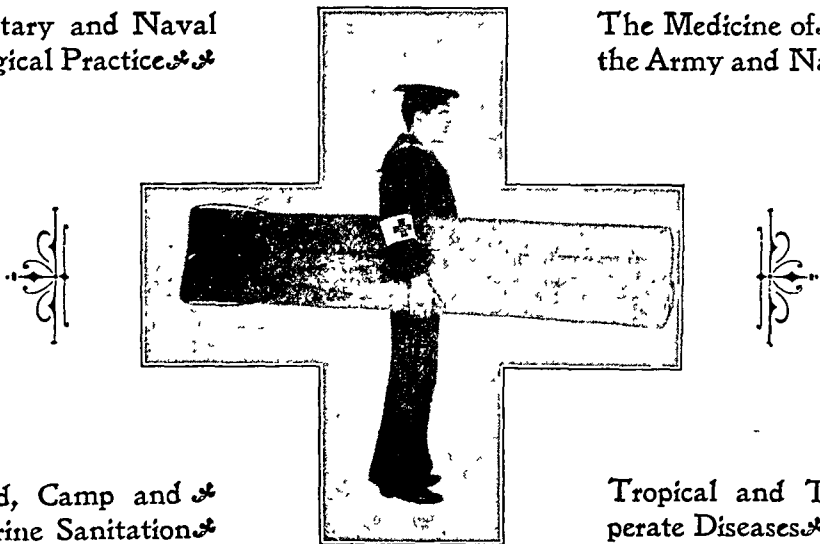
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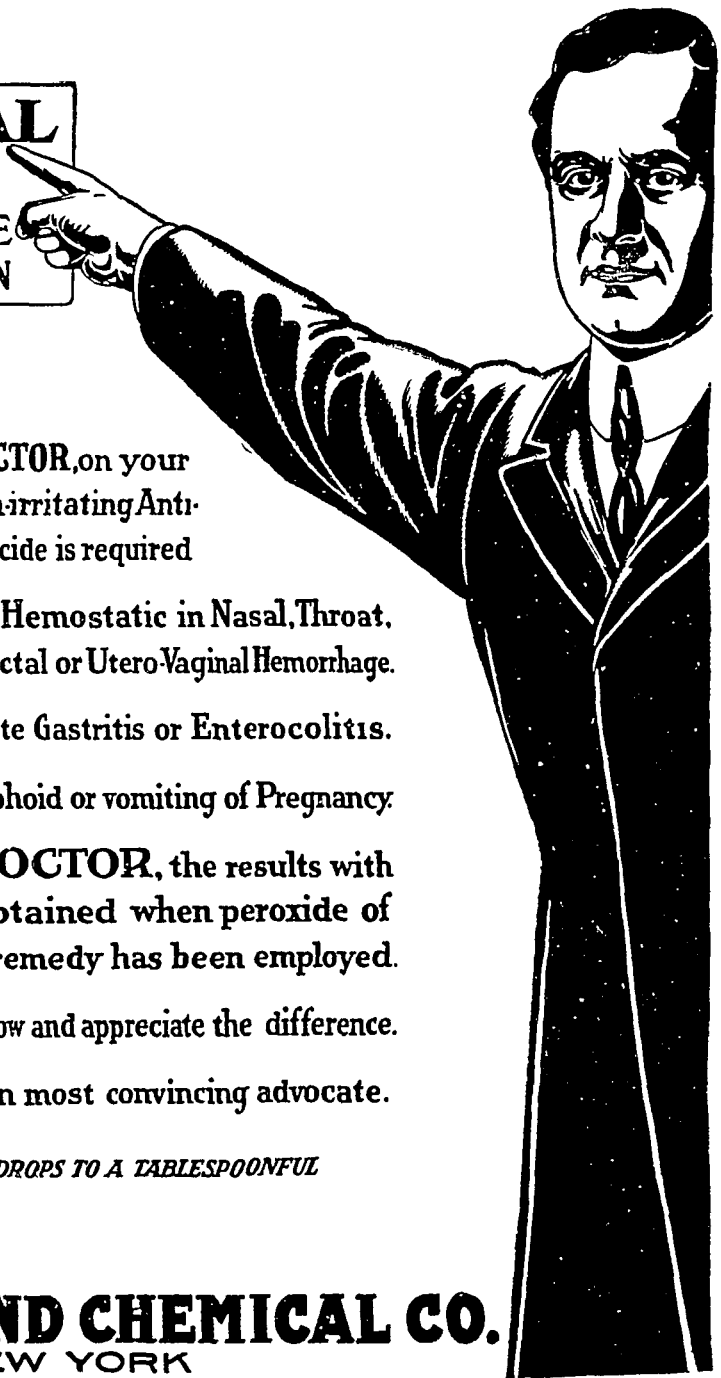
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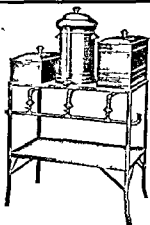
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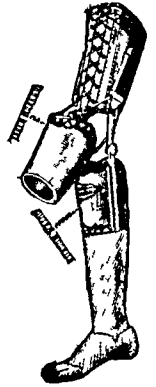
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# ANNALS OF SURGERY

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VOL XLV

FEBRUARY, 1907

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## ORIGINAL MEMOIRS

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### SEQUESTRATION ANÆMIA IN BRAIN AND SKULL SURGERY

BY ROBERT H M DAWBARN, M.D.,  
OF NEW YORK

Professor of Surgery in the New York Polytechnic Medical School Surgeon to the City  
Hospital of New York

Of all the operative causes of shock, admittedly the first and chief is hæmorrhage. Indeed, it has been said by able clinicians that shock is only another name for hæmorrhage\*.

The older a surgeon the greater becomes his respect for a drop of blood.

It seems strange that careful as we all are to apply this principle in cutting work upon the limbs it has apparently been overlooked (as to cordage) elsewhere. For example, prior to any bloody operation whatever upon an extremity, we elevate and accumulate in the trunk, neck and head, by gravity and sometimes also by centripetal massage most of its blood and then by cordage near the trunk maintain anæmia during the cutting. But what surgeon about to operate on however vascular a field of the head, the neck or the body, ever applies this same principle—and to avoid hæmorrhage accumulates blood in the extremities? Nobody for this purpose, so far

---

\*Crile on Surgical Shock p 138 (Explaining however that in reality hæmorrhage may be only one important factor in shock causation.)

as I am aware. And yet if wise in the one instance it is (at least as to preventing bleeding) obviously so in the other. To be sure we cannot deprive the other parts of blood to anything like the same degree that we employ in dealing with the members. Nevertheless, experience shows that we can with entire safety withdraw into the limbs some quarts of the whole bulk which constitutes one-thirteenth of the individual's weight. We can sequestrate before operation and retain in the limbs by cordage enough to make a striking difference in loss of blood from the operative field; enough, indeed, as the writer has convinced himself, to constitute in many cases the difference between life and death, between shock and absence of shock, in a gravely severe case.

This temporary bleeding, so to call it, into the patient's own extremities, is controlled as to degree, by the finger of an assistant upon the pulse. Its original volume and force being estimated, the sequestration proceeds until there is a plainly noticeable softening and lessening of tension. At this point begins the operation; and every cut vessel spurts less than otherwise would be the case. Indeed, were we unwisely to carry the plan to its limits, hardly any hæmorrhage would occur, but the patient's heart would beat so feebly as to cause him to faint away. Many a case, for instance, of attempted suicide from cut-throat has lived because of this, firm clotting occurring meanwhile at the mouths of the severed vessels. And as to effect upon respiration, this is proportionate to the extent of the bleeding, whether actual or into the patient's limbs, the breathing being always both accelerated and deepened.

But of course no such extreme is advised; simply a noticeable degree of pulse softening. If we reduce by even a moderate amount the quantity of blood otherwise surely lost, the gain in safety is obvious. Should the anæsthetist observe a tendency toward cardiac weakness it is easy almost instantly, by release of cordage, to produce a distinct improvement both as to force and number of heart beats.

This report is in the nature of a preliminary one. I am

experimenting as to whether by the circumference of the limbs taken before accumulation and again later on we can estimate the relative amount of blood withdrawn. It is possible that by testing the blood pressure before and after withdrawal into the limbs, using by choice the Riva Rocci apparatus with Cushing's improvements, the assistant may reach more accurate estimates than thus far have been attained. However, in no case out of many (including therein work upon the neck, chest, abdomen and pelvis, as well as a much smaller number upon the skull) has the writer thus far cause to regret using the plan. It is not, then, because of simply theoretical advantages that it is now brought forward but because it has practically been found a means of safeguard and reliance. And it can now be spoken of in terms which at first would not have been justifiable.\*

The technique is as follows. A towel folded lengthwise is wrapped about each thigh very close to the trunk, and upon this the rubber tube is tightened. The towel serves in a measure to prevent subsequent discomfort by spreading the pressure over a wider area. The degree of tightness is quickly learned by practice. It must nearly stop the venous but not the arterial current. Quickly the limb distal to the tourniquet grows dusky in color and there is obvious swelling also. After from five to ten minutes, according to the tightness of the cord, the softened pulse will indicate that we are ready to proceed with operating. The congested limbs are, however, first warmly wrapped and hot water bags placed about them.

In case the effect of the major anesthesia is feared, in a given instance these steps may be taken with a conscious patient in order to form a reserve guard of pure blood. And if then during operation failing respiration or other cause seem to justify it, removal of cord and elevation of limb or

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\*The writer distinctly states that he makes no claim for originality as to cording for the arrest of *accidental* hæmorrhage, either surgical or medical. As to the latter he would again call attention to a much neglected subject. See his paper in the Proceedings of the Surgical Society of the New York Academy of Medicine Nov. 9, 1891.



limbs will pour quarts, literally, of fresh blood into the narcotized, and the patient will awaken almost at once.\* But as a rule, to avoid discomfort, nothing is done until the subject is asleep.

When at first the writer began experimenting in blood sequestration a less simple plan was thought essential. Two limbs being swollen, the cord was tightened so that no further blood could enter, nor any escape. So far as a study of literature could guide, no case was discovered where absolute stagnation of healthy blood within a healthy limb for as short a period as a half hour had been followed by gangrene; but for safety, after fifteen minutes (if the operation must be longer) the assistant, trained to this purpose, began cording the remaining two limbs, almost at the same time commencing to release those first constricted; and in a long operation this shifting from arms to thighs, and back again, was done repeatedly. But after a time it seemed that we might obtain equally good results with less trouble; and since then the tube has been left so placed, as to degree of tension, that continually some blood enters—for the pulse is not wholly shut off—and of course some blood also escapes into the trunk. Only in case the limbs grow excessively swollen, or the pulse demands a change, is the tension altered during the operation. In a few plethoric individuals I have used constriction of all four extremities at once in this way. But generally cording the lower ones only—at the groin—has sufficed to accomplish much good in the way of blood saving.

Obviously, the ultimate return of so much blood into the general circulation ought not to be accomplished instantly. For the sake of the heart, the cords should be loosened rather slowly, taking nearly as long to release as to accumulate the blood.

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\* Of course for this purpose the idea is not at all new. It was first suggested (*re* anæsthesia, by Dr. David Webster in the N. Y. Med. Journal in 1887, and was tried by the writer within a month later. See also Atlanta Med. and Surg. Journal, Aug., Sept. and Oct., 1897,—articles upon Anæsthesia.

The question naturally arises at this point whether, as this is done, the restoration of the usual pressure will not be accompanied by so much spurting from a myriad cut vessels—if the field be large—that finally little would really be gained in saving of blood. Undoubtedly this would be the result if nothing further were to be suggested. But as a regular part of the procedure under discussion we must, before releasing the tourniquets, clot firmly the blood in the mouth of every divided vessel by the following step—to be considered the necessary corollary of what has gone before, and always to be used after it. I refer to an application of gauze sponges wrung dry, with the rubber gloved hand, out of actually boiling water brought at this moment to the operating table. Not ‘hot’ water, but water at 212 degrees F. No one need fear ill results to even the most delicate tissues of the human body from a few seconds’ firm application of gauze at this degree of heat—the brain perhaps excepted\*. And, in consequence, not only is bleeding prevented, but the entire raw surface turns white from coagulated albumen, sterilizing it if it was not sterile before. And thereafter, if contaminated by ichorous

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\* The author has not as yet tested upon animals’ brains the effects of brief contact at a boiling temperature, but as to nerves has done so, and they are not injuriously affected, if only a few seconds elapse in such contact. It was only after such experimentation that the following operation was performed. Upon October 11, 1906, at Dr John A Wyeth’s clinic at the N. Y. Polyclinic Medical School the author excised from the left side of the neck of a man of thirty a cancerous growth so extensive as to require the removal, in the mass, of practically the entire length of the deep jugular vein. The pneumogastric nerve was saved. During manipulation several suppurating lymph nodes ruptured, infecting the large wound which was first cleansed by irrigation as usual, then dried, and filled for fifteen seconds with water actually boiling when taken from the fire, across the room. As in the dog, so here, an instant effect was noticeable. The patient’s breathing was made much deeper and more rapid also the heart’s force was distinctly increased and the frequency was somewhat lessened. These effects upon the pneumogastric were observable for from three to five minutes. The wound was closed except for a narrow gutta percha tissue drain introduced at the lowest point through a counter opening above the shoulder and it quickly healed by primary union throughout. No subsequent adverse effect upon the nerve was observable. In repeated cases the writer has used the steaming

pus or septic fluids from the mouth or bladder, for instance, we are reasonably safe from danger of extension of such infection—very much as the surgeon feels regarding such a risk when once his wound is covered with healthy granulations.

Of course it is necessary, in order to prevent blisters, to avoid contact with skin or mucous surfaces. And obviously a very long application might, so to speak, cook the flesh. But used as advised, the writer has never had cause to be other than pleased with the result of employing this very old but much neglected application of heat.

Since atmospheric pressure makes such a difference in the temperature of boiling water, at high altitudes such as Denver it would be necessary for the best results to use water heated under pressure.†

Among the advantages of sequestration surgery (if I may use this term, simply to avoid a long periphrasis, whenever in this paper I must refer to it) in brain work its striking lowering of intracranial pressure is not the least. Where a brain tumor is to be operated upon, for one example among a num-

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gauze pressed for a few seconds—or even boiling water—in direct contact with the deep jugular vein; the youngest, a baby of a year old, immediately following removal of tubercular lymph-nodes; this was a patient of Dr. William A. Ewing, of this city, who assisted. There were no objectionable results; the venous current was too rapid to permit of heat clotting—and the infected wounds healed per primam.

In the pneumogastric case just discussed the author ended by doing his starvation operation (excision of the external carotid and its branches, with paraffin plugging of the terminal two).

Dr. Wyeth, who was present, remarked to the class of graduate students, that for the kind and size of operation the wound had been dryer—there had been less bleeding—than he had ever seen before. This we quote simply as bearing upon the technique under discussion, for this operation was done with corded lower limbs.

† It may be suggested that heat so employed may well take the place of Harrington's fluid, as sealing cut lymphatics and bloodvessels without use of irritant chemicals. Also prior to use of Mosetig Moorhof's bone-cavity filling, it will stop bleeding without harm—instead of the use of dry air at burning temperature pumped in, which risks superficial necrosis from the presence of a red-hot point close to or within the bone cavity, meanwhile. Of course the cavity must next be carefully dried, before introducing Moorhof's filling.

ber, a great risk of sudden death is thus avoided. To quote Sir Victor Horsley \* "Moreover, all cases of increased intracranial tension (as is now well recognized) are liable to die at any moment of sudden paralysis of the respiratory centre. How often one sees this accident in cases of intracranial tumor who are only at the very last transferred for surgical treatment!" Crile,† too, names excessive intracranial pressure first among causes of collapse due to injuries or operations affecting base of brain and medulla.

Horsley objects to ether because it invites more hæmorrhage in brain operation. And yet, though advocating chloroform admits its greater toxicity to nerve tissue. He adds

In the literature of the early days of cerebral surgery may be found instances of death upon the operating table, which I have no doubt were due to failure of the respiratory centre owing to a dose of chloroform having been given which, though perhaps not necessarily lethal in an ordinary case, was fully so to a patient whose bulb was hampered by previous tumor pressure." It must be obvious that the plan we are herein advocating is a distinct safeguard to some degree against the danger mentioned from each of these drugs, and from pressure. And conversely, in brain operations where already the pressure is dangerous (as in instances just quoted) Crile's pneumatic suit would obviously add to the risk unless indeed both of the common or the internal carotids be controlled as he suggests.

It is important in connection with Horsley's paper to note his method (*loc cit*) of treatment of hæmorrhage during brain work of the kind chiefly annoying—venous and capillary oozing, due to chloroform asphyxia which raises the intravenous pressure—he adds a stream of oxygen to his chloroform vapor. "It is interesting," he says, "to see how rapidly the bleeding stops as the color of the oozing blood changes from dark purple to bright scarlet. I frequently, therefore during operation, especially toward the end, request

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\* British Med Journal, Aug 23, 1906

† Surgical Shock p 151

the anæsthetist to turn on the oxygen for this purpose as well as for the elimination of shock."

For this interesting and valuable discovery we are thankful; but as to the following from the same paper, it is perhaps not beyond a mild criticism: "When the brain is obviously turgid with congestion I always ask that the chloroform percentage should be raised for, say, a quarter to half a minute, to one or two per cent. This at once induces a convenient, proportionate, and of course temporary anæmia" (by causing a fall in blood-pressure). Plainly, as sequestration does the same thing, we have in it "the ounce of prevention," and no need to push chloroform at all.

In controlling arteriole and capillary brain hæmorrhage, Horsley's favorite plan is hot water irrigation at a temperature "which should not exceed 115° F. nor fall below 110° F." He fears that if 120° be used, heat coagulation of the cut surface of the brain would result.

During a very recent visit to the Mayos at Rochester, Minn., the writer found Dr. Charles Mayo employing what is in effect the same idea as his own, in otherwise very bloody work upon head or neck. He employs *gravity* sequestration, however, instead of cordage. His patient is seated in a nearly upright posture, and Dr. Mayo stands upon a stool in order to be high enough to reach the field of operation. Obviously if there are any objections to be offered to the plan by sequestration they apply equally here; but Dr. Mayo has had no reason to regret adopting this idea. However, were chloroform to be the anæsthetic chosen, the upright attitude would self-evidently be unsafe because of its effect upon the heart. It is for this reason that its employment by dentists in the dental chair has been followed by fatalities not otherwise explicable.

In addition to Horsley's and Mayo's ideas as to control of hæmorrhage in this operative field we must refer to the recent suggestion of Dr. George W. Crile, in his paper read at Boston last June, in which he advocated in addition to "a head-up inclined posture," and his rubber pneumatic suit, exposing

and applying temporary clamps to the common carotids, to be released as soon as the operation is completed. This last he also suggested in his work upon Blood Pressure\*.

Thus far we have said nothing regarding a question which has doubtless occurred to all—namely, does sequestration-anæmia threaten shock?—depriving as it does, however, temporarily, the brain and heart of a considerable part of the blood.

The answer, based upon more than two years of trial in my practice, and covering many regions of head, neck, and trunk, is in the negative.

In all that we do as surgeons we are always selecting the lesser of (at least) two evils, and although—stated as a general principle—it seems desirable to keep the vasotonic centre well supplied with blood, yet there is evidence at hand that in numerous instances so brief a partial anæmia as that during an operation is well borne, and that, as compared with avoidable loss of considerable blood, in these instances the sequestration constitutes the lesser evil.

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\* Dr Crile says in this essay (*Journ Am Med Assoc* Dec 1 1906)

In 61 cases I have temporarily closed the common or external carotid without immediate or remote consequences."

This leaves us in the dark as to their relative frequency. It is surprising that so serious and so safe a vessel should be classed together in this indifferent way. Even temporary closing of the common—but long enough for the extensive operation required in radical cancer work in the neck—I should consider not justifiable when the same result, namely a dry operation can be obtained in a less questionable way.

Not long since Dr Charles Mayo remarked that in the neck there are just two structures which he holds in implicit respect and lets alone. One of these is the parathyroid bodies—the other, the common carotids of the elderly (which is the age requiring cancer operation). Dr John A. Wyeth in his Am Med Assn Prize Essay puts the mortality from closing of the common carotid at 40 per cent. Of course, however, this does not mean temporary clamping.

But as to such clamping or even definitive ligation of the *external* carotid this is a measure as wholly devoid of risk as anything surgical can well be. I say this after using it about seventy five times, of which more than fifty are given in detail (plus excision of this vessel) in my Gross Prize Essay, which upon p. 105 discusses this question. To speak as Crile does of it, as having a mortality rate of 2 per cent. from the washing away of the thrombus of the ligated stump *causing cerebral*

Indeed, if we reflect upon the main causes of operative shock, it is demonstrable that sequestration helps to a marked degree to prevent each of these. Omitting psychic causes, also needless rough handling, and the obvious fact that it follows work in certain regions more than in others, there may be said to be four main sources of shock due to surgery. These are: (1) Bleeding; (2) length of operation; (3) excess of major anæsthesia; (4) loss of vital heat.

As to the first of these, the advantage from sequestration has to be seen to be believed. The difference between excision of the upper jaw, for instance, accomplished with this step, and the same without, would be convincing enough in itself.

(2) As to length of operation, certainly a dry field has everything to do with this.

(3) Major anæsthesia, as every surgeon knows, is an important cause both as to depth and duration; and if, as will be proven by histories adduced herewith, in a brain operation, for example, the patient once under will, at least in some cases, remain so for long periods, just from anæmia similar to that in natural sleep, we have eliminated, in every minute so devoid of drugging, just so much risk of shock.

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*embolism*, is simply to state an anatomical impossibility, as it does not supply the brain. Other writers have made the same curious error. I do not doubt that the occasional deaths with brain symptoms following supposed ligations of this vessel have been due to the commonest of its numerous anomalies, and the one which is the rule in dogs, namely, that there was no external carotid, or one insignificant in size, but that instead the internal, on its way to supply the brain and eye, gave off in the neck all the branches usually derived from the external carotid. (See author's Gross Prize Essay, pp. 142-143, also Chapter VII.)

I have myself cost the life of one of my earliest cases by this very blunder, with its resultant extreme anæmia of the brain. I tied, above the level of the common carotid that vessel which when controlled stops pulsation both in the facial and superficial temporal arteries; but this, the customary test, is unfortunately not at all reliable.

There are but two which are trustworthy: (1) finding a frank bifurcation of the common carotid; and (2) instant contraction of the pupil on the ligated side, where this precautionary search has been neglected, when it may not be too late to undo the damage by promptly cutting the ligature. Also, this second test can be used, doubtless safely, by intentional stoppage of circulation with the finger-tip and noting the effect, or absence of it, upon the pupil.

(4) As is well known, ether and chloroform reduce temperature markedly. Hare has shown that ether very quickly brings it down two degrees Fahrenheit below normal. Consequently, by cutting off necessity for prolonged breathing of ether we prevent this factor in shock.\*

However, should any indications threatening shock appear—such as undue rapidity, weakness or irregularity of rhythm of pulse—it would be as simple as possible to end them by releasing one or both tourniquets, doing it gradually, to give the heart a little time in which to meet its added duty.

### ILLUSTRATIVE CASES

**CASE I—*Excision of Cerebellar Tumor*** This was a farmer, Mr. A. A. K., æt 60, married, denies history of venereal. A patient of Dr. E. A. Schnell, of Round Hill, Conn. This patient seen, and subsequently operated upon, at his home in the country, Valhalla, N. Y., gave the following history. For the past six months, at least, he had complained of headache of increasing severity, located in his occiput, right side, low down. This was accompanied by an increasing inability to walk, due chiefly to dizziness. His stomach was upset, and he had frequent attacks of projectile vomiting. Also his sight was rapidly failing.

This made a picture so indicative of cerebellum tumor that I advised calling in the services of Dr. James A. Meeks, an oculist, who reported choked disc, and advised in favor of immediate operation.

This was performed on May 10, 1905, by the writer, assisted by Prof. George F. Shiels, formerly of the University of California and by Drs. W. L. Griswold and John A. Clark, of Greenwich, Conn. Ether was the anæsthetic employed. With the trephine followed by the Devilbiss rongeur a large aperture was made exposing the right lobe of the cerebellum. An indurated portion of this was located, not encapsulated, and extending so far as the test by needle could determine, over an area of irregular contour, but perhaps involving one-third of this half of the

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\* Dr. R. C. Kemp's suggestion of keeping the rectum and colon filled with very hot normal salt solution during operations in general, using his rectal tube and an irrigator, deserves a more thorough trial than it has received.



hind brain. All this indurated portion was excised. It proved to be a glioma. The patient had hardly any bleeding, thanks to the accumulation of blood in his lower limbs; and, what surprised us all, once asleep he needed no more ether during all the time of operation—just three-quarters of an hour. He lay sleeping quietly, without stertor, and quite as if the natural anæmia existent during normal sleep were the determining factor in that condition rather than an artificially produced anæmia.

His recovery was without incident; and accompanied by a rapid improvement in all his symptoms. But when about a month had elapsed and he was once more up and about, in passing a catheter to relieve a prostatic congestion which troubled him occasionally, he infected himself; and the cystitis rapidly spread up the ureters, causing “surgical kidneys” and prompt death from suppression.

This outcome is recorded to give a full report; but surely the case may properly be classed as a success so far as the reason for operation is concerned; as also regarding the value of the method by cordage.

As to the advantage of avoidance, because of this, of the need for prolonged exhibition of ether or chloroform, when one reflects upon the usual risk of hæmorrhage from the delicate leptomeningeal vessels during the cerebral congestion accompanying vomiting after brain operations, and of hernia cerebri from bursting of the sutures in the dura, from the same cause, prevention of these risks seems indeed a distinct gain.

Regarding the duration of this operation without fresh anæsthesia and yet without pain or returning reflexes, for three-quarters of an hour of operation, we recognize of course that work upon any portion of the encephalon, once the dura is penetrated, is painless, except in the tract of any of the sensory cranial nerves, or along the course of the fillet. Perhaps brain work in a sensitive region would have compelled resumption of the anæsthetic sooner. But the longest period during which Sir Victor Horsley, for example, has been able to operate upon a cerebellar growth without necessity for renewal administration of the anæsthetic has been twelve to fifteen minutes

(loc cit) In the final case recorded in this paper the same complete success as to anæsthesia will be found noted. It has also been observed in other than head operations.

Though this was by no means an early instance of my employment of sequestration, it was the first in brain-work, and the earliest in which it occurred to me to try whether the moderate brain-anæmia might not suffice to maintain operative analgesia—once the patient was fully narcotized as usual.

CASE II (Operations 2 and 3) —*Trephining for Extradural Hemorrhage* Mr F S, American, æt 30, telegrapher, single, denies venereal history. First seen by the writer November 21, 1905, in his service at the City Hospital, twelve days after receiving a single severe blow upon the right side of the head from a club. No clear history obtainable as to his condition during the interval between the injury and admission—except that he complained of much headache and seemed increasingly stupid. Those about him were very unobservant people. When attention was first drawn to him he had a temperature of 102° F, rectal, and he was suffering from severe clonic convulsions, chiefly of his entire left side, to a lesser degree also upon his right half. He was wholly unconscious, and had gradually become unable to be aroused, during the past three days of the twelve. Both eyes were directed sharply toward his right, pupils equal and of normal size. Had a moderate degree of Cheyne-Stokes respiration. The shaven skull presented evidence of but one wound, quite superficial and partly healed. This was about 5 cm in length and situate over the middle of the right Rolandic fissure.

Evidently this man was suffering from pressure upon his brain, and the temperature of 102 led me to the erroneous diagnosis that we should find as cause, between dura and skull, the products of inflammation—fibrin, serum and pus. Instead, nothing was there but a large clot from rupture of the middle meningeal. And slowly the bleeding had increased the pressure until the convulsions, etc., appeared.

In a recent article upon brain surgery Dr M Allen Starr\* in discussing extra dural hæmorrhage asserts without qualification

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\* Jour Am Med Assn, Sept 22 1906

that the symptoms develop within six hours after the injury. Here is a case infinitely slower; and I have operated upon several where a few days had elapsed. It is plain that the time is dependent chiefly upon (*a*) the size of the broken arteriole and (*b*) upon what region of dura is being stripped up. In the temporal fossa this membrane is least firmly attached to the bone. Starr, in the same article, considers that when the hemiplegia, for instance, "does not come to its height for three or four days it is probable that there is a *surface hæmorrhage* due to the injury of a vein of the pia mater. A lumbar puncture will reveal bloody cerebro-spinal fluid." As stated, I am convinced that hemiplegia so developing in point of time would more often be explained as just mentioned. However, certainly lumbar puncture would be of unquestionable value simply in confirming a diagnosis of hæmorrhage; although the indication to enter the skull promptly for relief of pressure would exist equally in either case.\*

Regarding the question at which probable level beneath the skull a surgical hæmorrhage has occurred, perhaps it may be of interest to note how wide a difference of opinion is found even among surgeons of wide experience. From without inward:

(I) Deaver asserts † that all cases seen by him have been subcranial—(*i.e.*, between dura and skull); and he adds that so easily is the dura of the temporal fossa separated from its bone that, given a ruptured branch of the middle meningeal, this will happen without any fracture whatever.

(II) *Subdural* (*i.e.*, between dura and arachnoid). According to the English surgeon, Prescott Hewitt, this is the commonest variety.

(III) *Subarachnoid* (and into the meshes of the pia mater). Erichsen states that the commonest variety is at this level. (I do not imagine that it is possible to differentiate, practically, (II) from (III), and probably Hewitt and Erichsen mean one and the same thing.)

(IV) Into the substance of the brain or its ventricles; *i.e.*, true apoplexy. Unquestionably the rarest of these four, as a result of traumatism.

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\* Blood-tinged cerebro-spinal fluid withdrawn by lumbar puncture is a valuable sign of fracture at the base of the skull.

† Phila. Med. News, Feb. 15, 1890.

Returning to our patient Operation, under ether, assisted by the House Staff, November 21, within an hour after the case was reported to me Cordage for sequestration Incision upon his right Upon exposure of the bone, an undepressed fracture was at once evident, beginning slightly lower than the level of the skin abrasion, and extending roughly along the Rolandic line, and thence steadily downward and forward across the base of the skull further than could be followed On removal of bone with the Devilbiss rongeur, a very extensive and thick bloodclot was exposed—plainly the source of the left hemiplegic convulsions Its upper part was quite firm and partly organized, more so than that lying at the base, and which latter was evidently more recent Irrigation alone was ineffective, nothing short of the blunt curette sufficed to break up and dislodge the clot Much bone had to be sacrificed to get room to do this work, and for this the temporal muscle was split clear down to the zygoma and its edges widely retracted The handle of the curette was bent nearly to a semicircle, to permit scraping away the thick clot which was continuous right across the base, and even then its limits could not be reached From some point at the very base blood welled up at the seat of fracture as soon as the clot was dislodged there This was controlled by packing down against this point a thin strip of damp gauze well rubbed with glutol (formalin gelatin, powdered) This was removed five days later without starting up the bleeding (two attempts one upon the third, one the fourth day had showed that we must still wait)

There was no recurrence of the left-sided convulsions, the temperature promptly fell to normal and remained so, and the patient became partly conscious with eyes no longer turned toward his right

However, forty-eight hours after the first operation, my house-surgeon, Dr Thomas, reported by telephone that the man had begun to have severe clonic convulsions of his entire *right* side (it will be remembered that he had at first right-sided convulsions, but to a far less degree than upon his left), and a resumption of Cheyne-Stokes breathing Within an hour thereafter I visited him, finding the seizure apparently nearly as bad as that upon the opposite side had been This was to me most puzzling, however, the indication as to my duty was a plain one

Accordingly, the patient being again anæsthetized, the left Rolandic area of the skull was this time exposed and penetrated; but although considerable bone was removed with the Devilbiss rongeur, no blood clot was found; nor did the flat end of a probe passed between bone and dura at various points reveal any. Nevertheless the dura bulged into the bony gap, and without its normal pulsation. (I subsequently noted, in other cases, that the accumulation of blood in the limbs regularly puts a stop, almost or wholly, to the customary brain-pulsation observed, otherwise, in normal cases at operation.) Upon turning up a flap of dura we now exposed, lying beneath it—between it and the arachnoid and pia—an extensive, thick, partly organized clot, firmly adherent, covering an area as large as the parietal bone, and to all appearances being as old as the one removed from about the same level upon the opposite side two days earlier. It was removed in the same way—by blunt curette and irrigation. Plainly this clot was the main cause of his right hemiplegic convulsions. But no discoverable fracture—not even a crack—existed upon this left side. It must be clearly remembered, in studying this most rare case, that whereas the clot was *external* to the dura upon his right, it was *internal* to the dura upon his left. Unless this is explicable as an example of that condition, “contrecoup,” far more often written about than seen, the writer is unable to understand it. It seems probable that the extradural, basal bleeding re-started up at the first operation, as already chronicled, went on slowly beyond the point reached by the packing (which could only be extended to his left a little beyond the median line at the base); and spreading from below upwards, on his left, after the two days became—*plus* the large *subdural* clot—enough of a pressure-factor to have re-excited the right side convulsions, etc.

The recovery was ideal, and without incident. Three weeks later this patient was shown at a meeting of the Polyclinic Medical Society. At that time his faculties were entirely restored.

Regarding the bearing of these two operations on the special topic of this paper, all the staff noted with interest that, once under the anæsthetic, the patient slept quietly during the work upon both skull and clots, and only once or twice was a few drops more required. The first operation lasted fully an

hour, the second, about forty minutes. Also, it would seem probable that the accumulation of blood in the limbs aided clotting in contact with the gelatin gauze, because of diminished blood pressure at the bleeding point.

One deceptive sign in this patient—the temperature of  $102^{\circ}$  upon the twelfth day after the injury—is of interest. After barring out a rise of thermometer from infection of the superficial wound, should such be present—or from malaria, bronchitis, gastric catarrh, and from constipation—in a word, the usual causes, here remains a case requiring the opinion of an expert, and one of the neurologists to the hospital, Dr Græme M. Hammond, expressed the opinion that the fever was due to pressure irritation of the thermotaxic centre\*.

A case of this kind is distinctly encouraging as showing once more that a class of accidents—hæmorrhage from fracture at the base, until recently not held operable—can sometimes be saved by active intervention.

*CASE III—Trephining for Cerebral Cicatrix with Dural Adhesions.* This patient is a young gentleman, F. B. R., Jr., æt 18, who has been afflicted since the age of seven, at which time he fell from a height, fracturing the right side of his skull. Operation was required, and performed by a certain New York surgeon. During all the years between seven and eighteen this boy has been subject at times to the most violent fits of temper, though ordinarily of a most gentle and tractable disposition. Latterly, he has taken to drinking heavily, and has developed a periodic dipsomania. Upon examination of the skull two wide scars, each of about a finger's length, crescentic in shape, and

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\* Dr Willy Meyer, in the discussion following the reading of this paper, reported a case of his own during the past year, exactly parallel as to fever, and hence as to reason for supposing the hemiplegia to be due to pressure from products of inflammation—fibrin, serum and pus. But operation proved that the febrile temperature was caused only by a large blood clot beneath the skull. At a recent meeting of the N. Y. C. Surgical Society Dr Meyer has recorded yet another instance of such deceptive rise—the case proving at operation to be aseptic. However, absorption of fibrin ferment from the clot, or other quite usual causes of such rise would seem to explain it without need of the assumption given in the text.

roughly parallel with each other, indicate the fields of operation consequent upon the fracture in his childhood. The parietal boss was about midway between these scars. Under each of these broad cicatrices it was believed that the meninges were adherent to the brain, as a consequence of the original infective inflammation: for there was a history of prolonged suppuration before these semicircular wounds healed. For the past two to three years there has been frequent twitching of the fingers on the left—the side opposite these scars. His mother says there is never an hour when they are quiet, except when they are controlled by his will. This indicates cortical irritation in the region of the hand-centre in the præcentral convolution. Operation was advised, to separate brain from an adherent dura mater, if nothing else should prove necessary. Consultation with Dr. Frederick Peterson resulted in receiving from him urgent advice to permit operation; not as definitely promising improvement, but as positively asserting a hopeless condition if operation should be refused. In other words, the knife was considered the lad's only chance, and a rather poor one at that.

Operation was performed by the writer in Dr. Bull's private hospital, December 6, 1905, assisted by Drs. John B. Walker, George F. Shiels, J. H. Waterman, A. L. Goldwater. Anæsthesia (ether) by Dr. Thomas Bennett. An incision was made to run midway between the two long and wide crescentic scars aforesaid and the skull was penetrated accordingly. With the Devilbiss rongeur an area of the dura as wide as the thumb was laid bare, and all these pieces were saved in warm, normal salt-solution. Just as anticipated, adhesions were found. In stripping these away from the brain the sound of the separation could be heard to the confines of the rather large room—an indication of their degree of firmness. It was at one time contemplated to prevent readhesions by leaving goldfoil or other smooth foreign material in place between brain and dura; but final reflection caused me to fear that even this might (upon this hypersensitive cortex) itself constitute, as a foreign body however smooth, a brain irritant. Instead, a thin layer of blood was allowed to form over this brain area and to clot firmly, before permitting the brain to come into relationship again with its dura. This was only possible by aid of the sequestration of blood in the limbs. Because of this the brain was found by no means fully filling its brain-case;

the stripping was accomplished with a dull tool curved to follow the brain contour, and one could see to work within the curve of the calvarium far beyond what would have been possible, and with far less risk of brain laceration, than if a similar tool had been passed, guided only by sense of feel, between a congested, tuff brain and its skull.

The brain-work being ended, it was thought best to replace the pieces of skull. Since they were so small and of exactly equal size each compared with all the others, nothing can be more ideal than the Devilbiss rongeur for encouraging such bone replantation. Between thirty and thirty-five pieces were fitted together upon the dura, when this had first been sutured, where divided, with size double 0 of chromicized catgut. All of these pieces lived, being nourished by capillarity. It is obvious that the smaller the pieces of tissue of whatever sort which we attempt to engraft—whether of bone or ovary or thyroid gland or whatnot—the better its chance of surviving. For, its blood vessels being clotted, nothing but capillarity can carry to its interior the vitalized plasma which alone must nourish it.

In this instance we forgot to test the point noted in previous skull cases—whether anæsthesia once accomplished might not have been maintained by the brain anæmia due to the cordage. However, Dr. Bennett was asked to watch for any adverse signs consequent upon the accumulation of blood in both thighs and legs, and he reported that neither pulse nor respiration was affected in the least adversely. Duration of operation, one hour.

The patient had an ideal primary healing, his scar being practically invisible. As to results, from the time he awoke again until to day he has had no return of the twitchings of his hand, and he volunteered the statement that his head feels better and clearer than for years. However, after a few weeks he went upon a violent spree, and after trying hypnotic suggestion with only temporary benefit and the Oppenheimer "cure" with none at all he has now been sent upon a sea voyage to South Africa in a sailing vessel with a temperance shipper and with no liquor aboard. It is I fear, easy to prophesy the ending of this most pitiful case—an only son of fine parents. Perhaps had the operation in question been performed sooner, before the dipsomania showed itself, removal of the adhesions as a persistent cause of brain irritability might have effected a real cure.



CASE IV.—*Trephining for Cerebral Cicatrix with Dural Adhesions.* Miss O'C., a patient of Dr. J. D. Quackenbos, æt. 27, is brought with the following history. Since the age of eleven she has been an epileptic. In that year while swinging in a "scup" she fell, striking her head with enough violence against the corner of a house to render her unconscious. Her attacks at first, though irregular in interval, as always, were a month or less apart. For the past year they have much increased in frequency, latterly the worst being at night, and averaging perhaps a fit in each 24 hours. Her mental powers, always rather poor since the accident, have noticeably deteriorated of late. The attacks begin by a feeling of dizziness; if there is a true aura of any kind the patient is unable to describe it. She drops unconscious, kicking and making swimming motions with her upper limbs. Both sides are alike as to their involvement in the attacks. Menses regular and not painful.

An examination of the shaven scalp revealed an old cicatrix about 4 cm. long, over a depression of the skull, of nearly that extent, and of about 1 cm. depth, situate about 2 cm. above and to her left of theinion. This is where she was struck, as a child. Although this case is of a type of epilepsy offering little hope indeed from operation, when compared with the results of surgical intervention where the type is Jacksonian, yet it seemed quite likely that there was irritation from the depressed bone beneath the scar; and in any case, operation was urged by Dr. Quackenbos as being her only chance of help. Accordingly this was done at the Polyclinic Hospital, before the class, upon April 10, 1906. By use of the DeVilbiss trephine and rongeur all the bone involved was removed. Although there had been some depression of the inner table, this was less than of the outer, the diploe having been crushed compact at this point; and there was no evidence of irritation beneath the bone, no thickening nor exceptional adhesion of the dura, nor (tested by the flat end of a probe through a tiny slit in the dura) was there any brain adhesion beneath. Obviously, little improvement could be hoped for in consequence of our work. Because of the depression the pieces of bone were not replaced; and to protect the dura over the rather large bony gap, it was decided to use the special kind of celluloid plate recommended by the writer at the St. Paul meeting of the American Medical Association a few years ago; a

kind carefully deprived of all free nitric acid and with a trifle of synthetic urea replacing the usual irritant and abundant camphor, to give resiliency. Such a plate, transparent, resembling a yellow window pane, has several advantages, into which I can not go here. In this instance, fifteen minutes was the longest period during which the cording enabled the anæsthetist to discontinue chloroform. Once more it was noticed how satisfactorily dry was the operative field.

This patient's recovery was *per primam*. At this time, some seven months after operation her mother reports that the attacks are somewhat milder and less numerous than before operation. However such temporary improvement, due apparently to the vigorous counter irritation as much as anything, often results from mere penetration of the skull.

*CASE V—Excision of Foot Centre in Cortex for Relief of Jacksonian Epilepsy.* Mr C R, is a patient of Prof Græme M Hammond, in the City Hospital, New York who refers him to me for operation. Age 48 American, unmarried, occupation driver, is a blond fairly nourished but anæmic. Denies trauma, also venereal disease. Has had for seven years attacks of left sided convulsions at very irregular intervals of about two to three months, latterly rather more frequently, and coming on sometimes at night, which was not at first the case. Has long complained of headache over the right Rolandic area, no known cause for this. His attacks begin without aura other than a severe dull headache for a half hour before an attack, the pain being in the right Rolandic region. Then comes twitching of the left great toe, spreading rapidly to foot, leg and thigh, to left side of body arm and finally to face, but he never loses consciousness. Great weakness of the muscles involved for some days afterwards.

Two years ago was operated upon by another surgeon, the scar being plainly visible. A large omega shaped flap was then made and the skull opened accordingly. This was fully 6 cm too far forward to expose the motor centre and no good whatever was accomplished.

Upon December 17, 1906, I operated, in the presence of Profs Hammond and George F Shiels and Dr Edwin Beer, and assisted by Dr Wrenn, house surgeon, and the rest of the resident staff of the City Hospital. Dr Dettweiler, anæsthetist

Dr. Shiels kindly took charge of the sequestration-work. This patient had a severe degree of mitral insufficiency, not well compensated by hypertrophy. Chloroform was tried at first. Being badly tolerated, ether was substituted. Operation about two hours long, due chiefly to annoying oozing from the cut edges of the dura, which proved three to five times thicker than normal, over the area exposed (right Rolandic). This bleeding was trivial in amount, but of course had to be wholly controlled before closing the wound; also, the dural upper surface had to be dried before, with a naked copper wire and weak Faradaic current, the foot centre could be located. This being indicated approximately, the dural flap was cut accordingly; firm adhesions were found, binding the brain and leptomeninges to the thickened dura, and were separated with some little difficulty. Next, the precise situation of the foot-centre was ascertained upon the naked brain, and excised, cutting out the entire thickness of gray cortex over a superficial area of about  $1\frac{1}{2}$  cm. square. This centre was found, as expected, to extend beyond the top and to include the adjacent mesial part of the lobule. Just as a matter of interest the arm and hand centres were also located by the electric current, lying entirely anterior to the fissure, and between the centres governing the face and the trunk-muscles. To prevent re-adhesion a thin sheet of gutta-percha tissue was laid smoothly in place over the brain, covering the whole area exposed, and then the dura mater was sutured.\* To allow relief from pressure upon the cortex by the thick dura, the skull was not replaced, but instead a slightly dome-shaped piece of the special celluloid mentioned in Case IV was inserted. This was of but half the entire thickness of the calvarium in this region, yet was very strong, rigid and smooth. It rested upon a narrow ledge of the vitreous table, the outer one having been chiselled away a trifle for this purpose.

Regarding the result of sequestration in this case, it was very unsatisfactory because of the man's heart disease. For several periods, of about seven minutes each, anæsthesia was withheld, but then had to be resumed. Probably without sequestration the same could have been done. As soon as the limbs became

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\* Prof. Hammond has seen the skull re-opened five years after such a gutta-percha tissue layer had been used, and states that it was found very full of holes; and evidently before much longer would have quite disappeared by absorption.

distinctly swollen the heart beats mounted quickly to 130 or so at which point upon uncording, they dropped speedily to about 80. This was tried a second time, for purposes of study. Of course this operation was no fair test of sequestration, and this, too, was the reason of the long delay in checking the oozing from the dura. Were the blood not so actively flowing, the steaming gauze would have sealed the vessel mouths promptly. Given an example of uncompensated valvular disease we plainly have one of the instances—to be discussed later—where this operative aid (sequestration) is counterindicated.

Healing was by primary union throughout in this patient's case and without incident. As to the results of the foot centre excision upon his epilepsy Prof Hammond's detailed report is not given herewith because it has no bearing upon surgical technique but he expresses himself as well satisfied, and hopeful of a cure so far as the interval of time since operation permits him to judge.

CASE VI (and last making seven head operations by the method under discussion) —*Excision of Hand Centre in Cortex for Relief of Jacksonian Epilepsy*. Mr D. E. is a patient of Prof Græmie M. Hammond in the City Hospital, New York who refers him to me for operation. Age, 20, American, no occupation single denies venereal. He is short dark, well nourished stupid in expression. At the age of four met with an accident falling a short distance (unknown), striking upon his head. Doubtful whether this is important, for the convulsions began only at the age of nine. No other ascertainable cause. These occur from once to several times daily. They begin without aura, by twitching of the flexors of the left hand, spreading quickly up that arm and into the same side of the face. He is never unconscious because of them but feels exhausted afterwards. His left hand and arm are distinctly smaller and weaker than his right the hand clasp about half that of the right. The left hand is always the colder also. He can use simple language coherently but voluntarily mentions a failing memory, always poor but much worse of late. Is anxious for the operation advised by Prof Hammond—though that gentleman has but slight hope of its effectiveness in this case.

Operation in the City Hospital December 31, 1906. Present Prof Hammond, and resident staff. Dr Wrenn house surgeon,

Dr. Dettweller, anæsthetist. Chloroform anæsthesia, under which the operation was begun; but it was discontinued, and thereafter (forty-five minutes) work continued, including exposure and cutting of dura, and its final suturing, with only the analgesia due to the sequestration, and without any restlessness or other indication of suffering.

The Rolandic area upon his right was marked out, an omega-shaped flap, including the bone, was lifted by aid of the Devilbiss rongeur, and attempts made to locate the hand-centre through the dura by the copper wire and very weak Faradaic current. So irritable was the entire motor area of his cortex, however, that wherever touched with the wire all the muscles of the opposite side responded. However, after some minutes of this testing, and doubtless excited by it, a convulsion occurred, lasting a few minutes, and exhausting thereby the excessive irritability; so that upon its cessation we were able without difficulty to locate the hand-centre, causing no twitching in muscles elsewhere. The dura being turned up, the centre was more accurately marked, and excised, taking out a square piece of the gray, down into the white, the entire transverse width of the præcentral lobule; in dimensions about as in the previous case.

Nothing abnormal was noted at operation either in appearance of bone, dura, leptomeninges, or brain, in this patient. However, by microscope, the pathologist reports evidences, in the piece of cortex excised, of chronic abnormality in cellular arrangement. Details omitted as having no bearing upon surgery.

There remains one point of exceptional interest. During the cutting of the skull by the Devilbiss rongeur, along the terminal 4 cm. of this omega curve, the blade, which, travelling beneath the skull, should never penetrate the dura—and never has before, to my knowledge—in some way slipped through, and for this distance ploughed the brain-cortex. This caused bleeding, welling up from the cerebrum at points not possible of exact location. I did not wish to pack, neither to apply chemicals—other than adrenalin solution upon a narrow gauze strip tucked gently down into the brain tear—which, however, did not stop the flow at all. Finally, remembering that boiling water had not harmed the pneumogastric nerve in the case operated upon at Dr. Wyeth's clinic (see footnote earlier in this paper), I tried gauze wrung out of water at  $212^{\circ}$  F. and tucked down into the tear, as before.

This succeeded after several repetitions of a few seconds each. It apparently did no harm to the brain tissue, so far as the recovery is a guide. A narrow strip of gutta serena tissue, to prevent adhesion of the brain to the dura at this point, was smoothly laid down, and the dura was sutured above it. The bone-flap was replaced. After the dura was sewn the cording was released, taking five minutes, and now, after three quarters of an hour without chloroform and without pain, the patient began to wake up. Healing was by primary adhesion, with no unpleasant features whatever.

This case is too recent to permit of decision as to whether the operation is going to be of permanent benefit to his epilepsy or not.

If we now discuss the counterindications to this, which for convenience has been called sequestration surgery, it will at once be seen that they are quite numerous, and that a reasonable degree of common sense must be employed in determining when to use and when to avoid it. Like every weapon in our armamentarium capable of good, it is also capable of harm, if turned against a patient by a surgeon gifted in that way. Let us study these points, concerning which I have much to thank my friend Dr. Boise, of Grand Rapids. His article upon "Post Operative Embolism" is an equally clear study of ante-operative thrombosis, or again, of the causes which during sequestration would operate to produce clotting of the comparatively quiescent blood. To study these in an orderly way, one may say that there are three: (*a*) changes in the blood, (*b*) changes in the vessel walls, and (*c*) changes in speed of current. The last would be unimportant without one or both of the first two named, for normal blood will not at all readily coagulate when held even without motion within normal blood vessels, and in our technique a moderate degree of circulation is maintained throughout. In Bier's method of treating joint inflammation often the partial stasis by cording is kept up for a half day at a time and, though hundreds of cases have been reported, so far without dangerous result. But given either unhealthy blood or blood vessels as a predisposing cause,

slowing the current would then act as an exciting one, and make sequestration dangerous from venous thrombosis and possibly subsequent pulmonary embolism.

To specify several blood-conditions of serious import, we name the following: Recent typhoid, or any other septic condition of the blood, such as puerperal sepsis not long past; chlorosis, and indeed severe anæmia of any sort; and the presence of lime-salts in excess. Haward\* shows that the blood of typhoid convalescents is much more coagulable than normal, and that it contains twice as much lime salts; and implies that its increased coagulability is due to this last fact. Obviously, since increase of these salts invites clotting, and indeed since we use this knowledge in preparing patients for certain operations where there is likely to be troublesome bleeding, we must recollect not to do so if intending to employ sequestration.

As to diseases of the vessel walls, atheroma is an obvious counterindication. Of course yet others exist which we cannot stop to study at this time.

As tending to prevent thrombosis, it is interesting and soothing to remember that prolonged smoking markedly has this good effect. B. M. Richardson showed by experiment that after a long day's smoking the blood refused to coagulate at all, where in the same patient, blood drawn in the morning had clotted in two minutes.†

Accepting Horsley's assertion, quoted earlier in this paper, it follows that the duskiness of the limb—the cyanotic or venous character of the blood held within it—would rather tend to prevent clotting; at least he strongly recommends arterializing the blood by oxygen, when very dark in color, as a means of causing coagulation when bleeding would otherwise continue. And yet Haward (*loc. cit.*) names carbonic dioxide among a list tending to *increase* coagulability of the blood, and oxygen as *decreasing* the tendency to clotting.

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\* Hunterian lecture, *Lancet*, March 10 and 17, 1906.

† The Cause of Coagulation of the Blood, p. 101 (quoted by Haward, *loc. cit.*).

Plainly there is a contradiction here, and either Haward or Horsley is incorrect in his deductions

In conclusion, the following are the chief advantages of the method by sequestration in brain work of certain kinds

(1) A diminution in amount of anæsthetic needed, with consequent relative safeguard against bleeding due to straining from subsequent vomiting, and against hernia cerebri, also against lowering of vital heat

This operative analgesia is only obtainable with limbs well swollen and dusky. It is not always accomplished, but assuredly is in certain patients the number studied as yet not being large enough for us to reach percentage conclusions

(2) Ease of control of hæmorrhage during operation because of lessened intravascular tension

(3) A shortened operation because of a dryer field

(4) Through lowered intracranial pressure consequent upon accumulation of blood elsewhere there is lessened danger of sudden death from pressure upon the respiratory centre during work upon brain tumor, or upon depressed fractures, etc., and, too, just in proportion as there is bleeding, whether external or into the limbs, there is increased depth and frequency of breathing

(5) More space between brain and brain case, enabling the operator to work between, in removing old clots requiring curettage, or the separation of adhesions, etc., without risk of laceration of the brain surface



# PAPILLARY-CYSTADENOMATA OF THE BREAST.

A REPORT ON TWENTY CASES OF THE PAPILLARY CYSTADENOMA TYPE OF  
FIBRO-EPITHELIAL TUMORS OF THE BREAST.\*

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IN the Oration in Surgery delivered by Dr. J. Collins Warren at the meeting of the American Medical Association at Portland, Oregon, in July, 1905, a classification of benign breast tumors was presented which was based upon the study of 758 consecutive cases collected and analyzed by the writers of this communication. This classification was offered in the hope that the existing confusion in the nomenclature of tumors of the breast might be done away with.

The difficult point in the classification of benign breast tumors is the association of connective tissue and epithelium in their composition. The breast is a gland structure of epithelial lined ducts supported in a stroma of connective tissue. All tumors having origin in the breast tissue show a participation of both of these elements in varying proportion. In one case perhaps the fibrous tissue predominates, in another the epithelial, but an authentic case of a tumor composed solely of either fibrous tissue or epithelium has not yet been described. It is because of the attempts of different pathologists and clinicians to apply to the tumors of the breast the names accepted for tumors of other organs that such hopeless con-

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\* Read at a meeting of "The Obstetrical Society of Boston," Nov. 27, 1906.

fusion has resulted, and it was not until Ribbert in his classification of tumors offered a special group of mixed or "fibro epithelial" tumors that this confusion began to pass away. Ribbert's classification, however, is purely pathological and does not lend itself to the description of the different forms of tumors of the breast as they appear in surgical practice and the purpose of Dr. Warren's classification is to harmonize the clinical signs and symptoms of these tumors with their pathological nomenclature.

The first, and perhaps most important, distinction made by Dr. Warren's classification is the separation from the group of tumors of the diffuse processes giving to the latter the names of (a) diffuse hypertrophy and (b) abnormal involution. Cases of diffuse hypertrophy have sometimes been confounded with tumors of the periductal fibroma type, and abnormal involution or cystic disease has been regarded by many writers as a peculiar form of a new growth and has been called cystadenoma. Because of its diffuse character, however, this disease cannot properly be regarded as a tumor although the epithelium shows a tendency to proliferation which in certain respects closely resembles a neoplastic process. The lack of encapsulation, however, and the participation in the process of the whole breast and often of the breast of the other side seems to warrant its removal from the category of true new growths.

The fibro epithelial tumors of Ribbert have been divided by Dr. Warren into two groups—the fibrous and the epithelial types (see Table I).

TABLE I

CLASSIFICATION OF BENIGN BREAST TUMORS (WARREN)

## I Fibro epithelial tumors

- |                                   |                                                                                                                                            |
|-----------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------|
| (A) Fibrous type                  | $\left\{ \begin{array}{l} 1 \text{ Periductal fibroma} \\ 2 \text{ Periductal myxoma} \\ 3 \text{ Periductal sarcoma} \end{array} \right.$ |
| (B) Epithelial type (Cystadenoma) |                                                                                                                                            |
|                                   |                                                                                                                                            |

## II Hyperplasia

- (A) Diffuse hypertrophy  
(B) Abnormal involution (cystic disease)

Tumors of the fibrous type in which the fibrous tissue predominates have been called periductal fibroma, periductal myxoma, or periductal sarcoma. They are tumors arising from the peculiar hyaline periductal fibrous tissue of the breast, and they are made up for the most part of this fibrous tissue, although they contain portions of the epithelial gland substance in the form of much distorted ducts and clefts lined with epithelium. The bulk of the tumor is made up of fibrous tissue and it is classified as periductal fibroma, periductal myxoma, or periductal sarcoma, according to the degree of cellular development and richness in nuclei of this tissue. In these tumors it is obvious that the epithelium participates in the growth only as it is secondarily involved by the increase in amount of the fibrous tissue. They are the firmly encapsulated tumors found in the breasts of young women, may be single or multiple, are freely movable in the breast substance and have passed under a variety of names, such as, fibro-adenoma, chronic mammary tumor, proliferous cyst, adenocoele, cystosarcoma phylloides, intracanalicular papillary fibroma, etc.

The epithelial type of fibro-epithelial tumors are those in which the epithelial new growth overshadows the growth of fibrous tissue. In these tumors fibrous tissue is present merely as a stroma to support the epithelial new formation. Tumors of this type, or cystadenomata, are divided into two main classes—fibro-cystadenoma and papillary cystadenoma. The first class, the fibro-cystadenomata, are localized tumors of periductal fibroma origin, in which epithelial proliferation or cyst formation has progressed to such an extent as to overshadow the growth of fibrous tissue. These tumors have been described in the past as cystic fibroma or cystic fibro-adenoma. They are comparatively rare and are of little importance as compared to those of the second group.

Papillary cystadenomata are not uncommon. They are localized tumors—either single or multiple—and involve, as a rule, the large ducts of the breast. They consist of one or more cysts partially filled with papillary outgrowths, arising from

the wall. The papillary growths have a vascular branching connective tissue stalk supporting a luxuriant growth of epithelium in the form of villous projections and gland like interlacing tubules and canals. The epithelium shows no tendency to infiltrate the surrounding tissues. Tumors of this class have been recognized and described by many writers and under many names: adenoma villous papilloma duct papilloma duct cancer cystadenoma intracanalicular carcinoma villex endocanalicular papillary fibroma etc.

The material upon which this report is based consists of twenty cases of papillary cystadenoma. The specimens were obtained from private practice and at the Massachusetts General Hospital in the services of the following surgeons: Dr J C Warren Dr A T Cabot Dr H H A Beach Dr C B Porter Dr M H Richardson Dr J W Elliot Dr W M Conant Dr S J Mixter Dr F G Balch Dr R B Greenough Dr C A Porter and Dr C L Scudder to all of whom the writers would here express their thanks for the privilege of reporting the cases. Much of the pathological material was placed at our disposal by Drs W F Whitney and J H Wright to whom we would also express our gratitude.

Of the twenty cases of papillary cystadenoma three showed the presence of adenocarcinoma. In the other seventeen cases no evidence of malignant disease was to be obtained. A gross and microscopic examination was made of the specimen in nineteen of the twenty cases. In seventeen cases the microscopic specimens and in many cases the gross specimens also were available for re-examination.

The gross appearances of the seventeen specimens of simple papillary cystadenoma showed the following characteristics. A palpable tumor was present in the breast substance in every case. In twelve instances the tumor was single. In five a number of different nodules were present forming a conglomerate mass. The tumors varied from the size of a pea to that of an orange. Their situation was almost invariably in the central portion of the breast close to or under the nipple although the larger cysts extended outward and occasionally

occupied almost the entire substance of the gland. In cross section these tumors presented one or more cysts of varying size containing fluid, which was usually bloody, and filled to a greater or less extent by papillary outgrowths from the wall. The cysts were as a rule well marked off from the surrounding breast tissue and were not adherent to the skin, although in six cases the skin appeared to be closely applied over the tumor and was not freely movable, a fact which was attributable rather to the size of the cyst and its position near the nipple than to any infiltration of the tissue. Retraction of the nipple was noted in the record in three of the seventeen cases of simple papillary tumor and in two of the three cases of adenocarcinoma. It is possible that the development of a benign tumor in the large ducts acts in somewhat the same way as the development of cancer to cause a drag upon the ducts and retraction of the nipple.

The axillary glands were enlarged in only two cases. They did not show malignant involvement even in the cases of carcinoma.

Microscopic sections of the tumors showed one or more cysts. The cysts were as a rule well marked off by a definite layer of fibrous tissue from the surrounding substance of the breast. The breast tissue usually showed evidence of compression by an increase of its fibrous tissue, and occasionally the presence of a small amount of round-cell infiltration. In some cases involution changes were present in the surrounding tissue, which is not surprising when we consider the age of the patients under consideration.

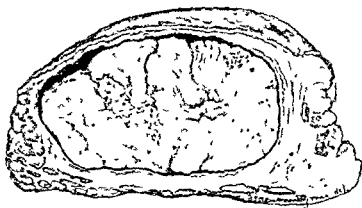
The walls of the cysts were lined with flattened or columnar epithelium which was apparently derived from the larger ducts (Figs. 1 to 6). In one specimen of a tumor of this nature, not in this series, a fortunate section revealed a continuous line of epithelium from the nipple to the wall of the cyst cavity.

The most characteristic feature was the presence of papillary outgrowths from the cyst wall. These papillary growths were composed of a fibrous tissue stroma, with many blood vessels, supporting one or more layers of epithelium continuous



FIG. 1.—Papillary cystadenoma from a girl of 19 removed by an areolar incision. The specimen consisted of a cyst cavity situated directly under the nipple and filled with papillary ingrowths. These varied greatly in size, shape, consistency and color, and the whole could be aptly compared to a gall bladder full of stones. The color and shape of these ingrowths was due to edema, hemorrhage and necrosis.





The cyst was of four years duration and occurred in  
 single large type of cyst the size being due not  
 There was a small fistulous opening through  
 mass of grayish white friable tissue which on  
 section was composed of distorted glands and fine fibrous stalks largely necrotic





FIG. 3.—Papillary cystadenoma. Section showing the cyst wall and papillary ingrowth. The cyst was lined by a layer of flattened epithelium. The fibrous tissue around this was dense and infiltrated with round cells. The gland ducts in the vicinity were flattened and mechanically disturbed, but otherwise showed little change. The papillary growth completely filled the cyst, which was 2 cm. in diameter. It apparently had several attachments, one of which is seen to the left of the photograph, although this evidently is not the chief one. The appearance of the glands and fibrous tissue is well shown. The dark areas in the papillary growth, (suggesting artifacts) are vessels filled with blood. On the right of the drawing (where the glands are not as numerous) the fibrous tissue is cedematous.



FIG. 4.—Papillary cystadenoma. Small multiple type. These tumors were situated under the nipple and occupied the larger ducts. They were all small, the largest being but  $\frac{1}{2}$  cm. in diameter. The papillary projections in the one to the right of the photograph are formed of delicate branching stalks of fibrous tissue covered with epithelium, the whole forming an irregular mass of somewhat atypical gland ducts. In the cyst in the center of the specimen the epithelial proliferation has been so great as to mask the fibrous tissue, while in that in the left the fibrous tissue is abundant, somewhat necrotic and hemorrhagic. There is a large amount of interstitial fibrous tissue surrounding the cysts.



FIG. 5.—Papillary cystadenoma with adenocarcinoma. The upper photograph shows the cyst cavity to the left and the adenocarcinoma (the dense white area) on the right.

In the lower photograph the cyst cavity is seen to the right of the nipple partially filled with papillary ingrowth from the base of which the adenocarcinoma has developed. This is almost directly under the retracted nipple and is adherent to the skin.



FIG 6—Papillary cystadenoma and adenocarcinoma. Section through the wall of a papillary cystadenoma. The cyst was situated under the nipple and was 2 cm. in diameter. It was filled with bloody fluid and contained a friable papillary ingrowth. Microscopically at the base of the papillary growth the surrounding tissue was infiltrated by the atypical glands characteristic of adenocarcinoma.

- A Papillary growth
- B Cyst cavity
- C Cyst wall
- D Adenocarcinoma



with the lining of the cyst. The papillary masses were often divided into many branches and occasionally interlaced in such a way as to present the appearance of a multitude of gland tubules and ducts, lying in a fibrous stroma. The papillæ were often attached to the cyst wall at several points in their circumference. Degenerations of the connective tissue, hæmorrhagic areas and areas of œdema were not uncommon.

The epithelium appeared in many different forms. The lining of the larger cysts was commonly flattened and of several layers. That of the smaller cysts was higher and that covering the papillary outgrowths was often columnar and of different degrees of size and development varying from the familiar narrow cells of the normal ducts, to the high, columnar, well formed cells seen in the adenomatous proliferation of abnormal involution. So far as anatomical and histological data were available, the origin of the papillary cystadenomata was in the fibrous tissue and epithelium of the walls of the larger ducts.

The degree of proliferation of the epithelium varied in different specimens and even in different portions of the same microscopic section. In one place several layers of flattened cells were found, while in others a single layer of high columnar cells alone was situated against the basement membrane.

The rate of growth of these tumors is very slow, and, as might be expected, the epithelium showed but little evidence of rapid reproduction, mitoses were occasionally seen but were comparatively rare. Degenerative processes in the papillary masses were not uncommon, and in one specimen particularly, a hyaline degeneration was observed which produced homogenous masses of varying color from red to green and black which resembled gall stones closely as the papillary growths lay in the opened cyst.

The cyst cavity, in addition to the polypoid tumor masses, contained serous or sanguinolent fluid, apparently from thrombosis or rupture of the vessels of the villous stalks, and in some specimens the wall of the cyst was deeply stained with blood pigment of similar origin.

With regard to the etiology of tumors of this type very

little can be said. Trauma was cited by the patient as the supposed cause of the tumor in five cases. In eight cases no history of trauma could be obtained, and in seven no data on this point were available. So far as age is concerned, the papillary cystadenoma is generally a tumor of old age. The average age of twenty patients was 49.5 years. The extremes, however, cover a large period—the youngest patient being 19 years old and the oldest 81. It is to be noted that no gross or microscopic peculiarities were found to differentiate the tumors of young women from those of older years. The influence of marriage and lactation does not appear to be significant. One of the twenty cases was a male patient of 51 years of age. Of the nineteen women, eleven were married and eight had had children. Thus of nineteen cases of papillary tumors there were eight in women whose breasts had undergone lactation, and eleven in those which had not. Whether in development the polypoid outgrowths from the wall of the duct produce the cyst, or whether the cyst is first produced, and the papillary outgrowth is a secondary process, can only be a matter of speculation.

The symptoms of papillary cystadenoma are perhaps more characteristic and better defined than those of the majority of tumors of the breast. One or more nodules are found in the central portion of the breast, not far removed from the region of the nipple. These nodules may vary from the size of a pea to that of an orange or larger. They are generally described as hard in consistency, but if not too deep in the breast tissue, and if of sufficient size, an elastic or cystic feeling may be appreciable. One tumor was described as soft, and in a number of cases no tumor at all was felt until some time after the recognition of the bloody discharge from the nipple. The size of the tumors varied in certain of the cases, according to the amount of fluid contained, and could be diminished at will by pressure, forcing the fluid out through the nipple. Pain was present in about one-half of the cases, but was rarely severe, and was not a conspicuous symptom of these tumors, in distinction to the more painful character of abnormal involution.

The symptom which is of the greatest value in the differentiation of papillary from other tumors of the breast is the existence of a serous or bloody discharge from the nipple. This discharge was present in eleven of the twenty cases, while in four of the others the record failed to give information upon the point. It is not to be expected that discharge will always be present, as the escape of the fluid must depend on the patency of the duct between the cyst and the outer world. In one case a fistulous opening was established from the cyst through a sinus which opened at the edge of the areola, but such a condition is obviously rare.

Tumors of this type are of slow growth. The average duration of the tumor before operation was 25.8 months, the longest being eight years and the shortest one month. It is significant, however, that in three cases at least the discharge from the nipple was present for a long time prior to the discovery of the tumor.

Enlargement of the axillary glands to such an extent as to make them readily palpable is not to be expected. In two of the twenty cases the records state that enlarged glands were felt in the axilla. In the remaining eighteen, including the three cases of carcinoma, no enlarged glands were felt. It is well known that in thin persons, and as a result of irritation enlargement of the axillary glands sufficient to make them readily palpable is not uncommon. In cases of abnormal involution this frequently occurs. The presence of slightly enlarged glands, however, is of little significance in diagnosis.

The diagnosis of tumors of this character from other tumors of the breast is facilitated by three chief symptoms—*i. e.*, the situation, under or close to the nipple, the slow, painless growth, and the presence of a discharge from the nipple of bloody fluid. As accessory symptoms it should be noted that the skin is not adherent, nor are the axillary glands enlarged.

The conditions with which these tumors are most likely to be confounded are cancer, abnormal involution and periductal tumors. From cancer they are distinguished by their



slow growth, definite outline, and by the freedom of skin, muscles, and axillary glands from involvement in the disease. Discharge from the nipple in cancer is very rare.

From abnormal involution the diagnosis is more difficult. Serous discharge from the nipple in such cases is occasionally noted. The diffuse character of this condition, however, and the irregular nodular consistency of the breasts associated with pain and tenderness are points that aid in differentiation. Involution changes also are more common in the periphery of the breast, while papillary tumors occur almost invariably near the nipple.

From periductal fibromata, the diagnosis should not be difficult. The periductal tumors occur, as a rule, at a much younger age. They are firm and elastic, often of large size, and rarely occur near the nipple. They slip and slide in the breast tissue, and never produce discharge. The periductal fibromata are far more likely to be confused with the fibrocystadenomata (the other type of the cystadenoma or epithelial group), and it is doubtful if the two can be distinguished without the aid of the gross and microscopic examination.

The prognosis of a papillary cystadenoma is uncertain. They are tumors of slow growth and may exist for years without producing serious inconvenience. By the English writers, tumors of this type have been described which in time protruded from the nipple as granular and bleeding polypi. This did not occur in any of these cases. Enlargement to such a size as to cause serious disfigurement did not occur, although one tumor as large as an orange was produced, and a fistulous opening leading to the cyst was already established when the case came under observation. There was no obvious supuration, but it is to be supposed that infection might readily occur and be followed by necrosis and sloughing of the tumor.

As in all of the tumors of the adult breast, the chief point of interest in prognosis is the likelihood of cancer. In this series of twenty cases, cancer was present in three instances and appeared to be associated with the existence of the papillary tumor, that is, the cancerous nodule was in the wall of the

cyst and the type of growth adenocarcinoma was the same in all three cases. Except for the infiltration of the surrounding tissues the cancerous nodules presented characteristics of growth of the same general character as the papillary structures within the cyst although the irregular cell growth and infiltration left no doubt about the diagnosis of adenocarcinoma. The occurrence of cancer however in fifteen per cent of the cases of papillary cystadenoma is sufficient to warrant the early and complete removal of these tumors and to justify their classification in a group apart from the periductal type of fibroepithelial tumors which show no such predisposition to the occurrence of malignant disease.

The duration of the three cancer cases was 9, 17 and 18 months respectively and their ages were 52, 69 and 76 years. Several of the cases which showed no evidence of malignant disease had been in existence for much longer periods and in women of equally advanced years. It is perhaps worthy of note that none of the cancer cases showed the familiar symptom of discharge from the nipple whereas it was present in all of the non malignant tumors of more than eight months duration of which we have specific notes. The occurrence of cancer in tumors of this character has been noted by many writers. It is undoubtedly this tendency which has led the English writers to the indiscriminate use of the word duct cancer for papillary tumors of this kind. Tietze and Sasse have each described cases of this character under the names of cystadenoma proliferum destruens malignum (Sasse) and adenocarcinoma destruens (Tietze). That a form of adenocarcinoma occurs in certain cases of papillary cystadenoma is supported by this series of cases but that this is sharply to be differentiated from other forms of adenocarcinoma is perhaps open to question. Of the three cancer cases two showed no evidence of recurrence at one and two years after amputation of the breast the third case died of recurrence four years after operation. In only two cases however was the axilla dissected and in these no diseased glands were found. In none of the three cases were the axillary glands palpably enlarged.

From the consideration of the course of development of papillary tumors of the breast it is obvious that radical removal of the tumor is to be advised. As in all other cases of breast tumor also, the frequency of the occurrence of cancer makes an exploratory operation the duty of the surgeon in every case of tumor in which the diagnosis cannot positively be determined to be benign and free from danger of subsequent malignancy; and the number of such cases, with the exception of the small multiple periductal fibromata, is almost nil. When the tumors are large, or multiple, amputation may be necessary to obtain complete removal; but when small and single the breast should certainly be saved. Excision may be performed from the under side of the breast by the "plastic resection" operation advised by Dr. Warren and described in the *Journal of the American Medical Association*, July 15, 1906. In some cases, however, the operation may be simplified, and a small tumor under the nipple readily removed by an incision which follows the lower border of the areola for a quarter or third of its circumference. This incision is carried through the skin alone. With retractors the wound is then drawn open in a direction radiating from the nipple, and the subsequent dissection for the removal of the tumor is carried on by radial incisions in order to avoid injury to the other ducts than the one involved in the tumor. This incision does very little damage to the breast and leaves a scar which is scarcely discernible after a month or two has elapsed.

If microscopic or gross examination of the specimen reveals the presence of carcinoma, it is obvious that a complete operation should be performed. In such a case the pectoral muscles and the axillary contents should be removed, for, although the type of cancer is of relatively low malignancy, the complete operation is only a reasonable precaution. When this is done, the prognosis should be far more favorable than in the average case of cancer of the breast.

Of the seventeen cases of non-malignant tumor in this series, seven had an amputation of the breast, eight had the tumor excised by a plastic or direct incision, and two by the

areola incision In one of the amputation cases the axilla was also dissected The results of these operations were as follows

Of the seven amputation cases, one patient could not be traced, five were free from disease at periods of one, one and a half, two, three and eight years after operation, and one died of old age and debility three years after operation without recurrence

Of the ten excisions, three were untraced, one showed a local recurrence of the tumor after six months, which has persisted for three and a half years without further increase, another showed a local recurrence eighteen months after operation, which was removed, and the patient has not since reported The other five cases were examined or reported free from disease at periods of one and a half, three, six, and eighteen months, and four years after operation Of the two cases of recurrence, one was proved by microscopic examination to be similar to the original tumor and non malignant, and the other had existed without change for three and a half years, so that the presumption is fair that complete removal of the original tumor was not obtained at the first excision It is obvious that this should be done in every case, even if amputation is required, but we believe that so radical a procedure is rarely needed

#### SUMMARY

Twenty breast tumors of the papillary cystadenoma type showed the following characteristics

(1) They were single or multiple, involving the large ducts near the nipple, and composed of one or more cyst cavities from the walls of which grew papillary outgrowths composed of a fibrous tissue stroma and a luxuriant growth of duct epithelium in the form of irregular gland tubules and polypoid projections

(2) Tumors of this character have been described by many names, viz adenoma, duct papilloma, duct cancer, vilous papilloma, cystadenoma intracanalicular, proliferous cysts, etc

- (3) They occur in the male breast as well as in the female.
- (4) They occur at all adult ages and independent of trauma, marriage or lactation.
- (5) They are usually painless.
- (6) They are generally situated near to or beneath the nipple.
- (7) They are usually of small size, but occasionally attain the dimensions of an orange.
- (8) They are of slow growth.
- (9) Their most characteristic symptom is the presence of a discharge from the nipple which may be serous, but is usually bloody in character.
- (10) Do not cause enlargement of the axillary glands.
- (11) Fifteen per cent. of the twenty cases in this series were associated with a form of cancer (adenocarcinoma) of a relatively low type of malignancy.
- (12) Treatment demands the complete removal of the tumor, either by excision or, if necessary, amputation of the breast.
- (13) Excision may be performed by plastic resection or by an areola incision.
- (14) The association of cancer with papillary cystadenoma in fifteen per cent. of the cases justifies the separation of this group from other fibro-epithelial tumors of the breast in clinical and pathological classification.

#### ABSTRACT OF CASES.

I. No. 123. 1896. Dr. J. W. Elliot (ix-180). Female, 57. Married, 1 child. 2 months' duration. Tumor, size of walnut. Right breast. Upper outer quadrant, no pain; discharge not recorded. Excised. Recurrence 2 years later. Same situation. Size of hen's egg. Excised. Both papillary cystadenoma. No later report.

II. No. 11. 1896. Dr. J. C. Warren (320-44). Female, 44. Single. 6 years' duration. Tumor, 2 inches in diameter. Left breast. Upper half. Pain slight. Discharge from nipple for 10 years. Excised. Papillary cystadenoma. No later report.

III. No. 65. 1897. Dr. H. H. A. Beach (325-211). Female, 52. Married, 1 child. 11 years' duration. Tumor, 3 inches in diameter, under nipple. No pain. Discharge not recorded. Excised. Papillary cystadenoma. No further report.

IV No 15 1895 Dr A T Cabot (334-70) Female, 61 Single 9 months' duration Tumor, size of orange Left breast, under nipple No pain Discharge not recorded Amputation Papillary cystadenoma 1906, reports no further trouble

V No 91 1900 Dr H H A Beach (339-2) Female, 57 Widow 2 miscarriages 1 months' duration Tumor, size of hazel nut, under nipple Pain slight Discharge serous for 10 years Bloody in last 12 months Excision Papillary cystadenoma No later report

VI No 217 1901 Dr J C Warren Female, 81, single Tumor, size 3 cm, near nipple Slight pain No discharge Amputation Papillary cystadenoma Died 3½ years later of old age and debility No trouble with breast

VII No 166 1902 Dr A T Cabot (11-220) Female, 42 Married 6 children, 1 miscarriage. Normal lactation 1½ years duration Tumor size almond, under nipple Slight pain Discharge brownish and bloody for 3 years Excision Papillary cystadenoma Tumor recurred in same situation and has persisted for 4 years No further operation

VIII No 171 1902 Dr W M Conant (11x-14) Female, 45 Married, 8 children 2 miscarriages Breast abscess on other side 2 years ago 6 months' duration Tumor under nipple No pain Discharge bloody on pressure Excised Papillary cystadenoma Report, 4 years later, no trouble

IX No 184 1903 Dr W M Conant (1cxxx1-295) Female, 35 Married, 8 children 1 years duration Tumor size of chestnut, under nipple No pain Bloody discharge Amputation Examination, 4 years later No trouble

X No 204 1904 Dr S J Mixter (469-145) Female, 67 Married, children? Duration 2 years Tumor, size of egg, near nipple No pain Discharge not recorded Amputation Papillary cystadenoma Reports, 3 years later, no trouble

XI No 210 1905 Dr C A Porter Female, 43 Married, 4 children 4 years' duration Tumor, size of small orange, near nipple Sinus at edge of areola Painful of late. Discharge from sinus watery and bloody Amputation Papillary cystadenoma Report, 18 months, no trouble

XII No 209 1905 Dr R B Greenough (42-352) Female, 19 Single 1½ years duration Tumor, size of half a hen's egg No pain Bloody discharge from nipple Excision by areola incision Papillary cystadenoma 19 months later, examination, no further trouble

XIII No 211 1905 Dr Wm M Conant Male, 51 4 months' duration Tumor size of walnut Upper outer quadrant Pain not marked Bloody discharge from nipple on pressure Amputation with dissection of axilla Papillary cystadenoma Examination, 16 months later, no trouble

XIV No 205 1906 Dr S J Mixter Female, 24 Single, 4 years' duration Tumor size of lemon, under nipple Slight pain at time of catamenia Discharge from nipple bloody and purulent(?) Excision Papillary cystadenoma No later report

XV. No. 206. 1906. Dr. J. C. Warren. Female, 34. Married, no children. 8 years' duration. Tumor, size of walnut. Right breast; lower inner quadrant. No pain. Discharge not noted. Plastic resection. Periductal fibroma and papillary cystadenoma. 6 months later, result perfect.

XVI. No. 208. 1906. Dr. F. G. Balch. Female, 30. Single. 4 months' duration. Tumor, size of walnut, under nipple. Considerable pain. No discharge. Excision with areola incision. Papillary cystadenoma. Result, 3 months later, perfect.

XVII. No. 212. 1906. Dr. C. L. Scudder. Female, 40 Single. 7 years' duration. No pain. Bloody and serous discharge. Plastic resection. Papillary cystadenoma. No later report.

XVIII. No. 216. 1898. Dr. S. J. Mixter (333-177). Female, 52. Married, no children. 9 months' duration. Tumor, 2 inches in diameter, near nipple. Pain slight. Discharge not recorded. Nipple retracted. Skin adherent. No glands felt in axilla. Amputation. Papillary cystadenoma and adenocarcinoma. Died four years later of cancer of the breast.

XIX. No. 215. 1901. Dr. H. H. A. Beach (385-136). Female, 76. Widow, 2 children. 1 year duration. Tumor, size of walnut; upper inner quadrant. No pain; non-adherent. No gland felt in axilla. Amputation. Axilla not dissected. Papillary cystadenoma and adenocarcinoma. Report, 1 year later, no recurrence.

XX. No. 214. 1905. Dr. J. C. Warren. Female, 69. Single. 18 months' duration. Tumor, size of walnut, under nipple. Adherent to skin. No glands felt in axilla. Slight pain. No discharge. Complete amputation. Axilla not dissected. Papillary cystadenoma and adenocarcinoma. 2 years later, examination showed no recurrence.

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# PUERPERAL GENERAL PERITONITIS,

REPORT OF ELEVEN CASES

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THE problems of puerperal infection are still unsolved and, since the introduction of aseptic methods into obstetric practice, no great advance has been made in the prevention and treatment of the condition. While women continue to lose their lives in such large numbers from this condition, little help has been offered by investigation. This disease annually accounts for thousands of deaths in this country, and is more worthy of study than many more abstruse but less important problems investigated by special committees and under special grants.

The course of puerperal infection shows but little difference from that of severe infection in other parts of the body. The great severity of the condition is due to several factors. The pregnant woman is more susceptible to infection, in general, than the non pregnant, and is prone to disturbances of metabolism which lessen resistance and decrease elimination. The traumatism of labor causes a local disturbance of circulation and the raw surface of the uterus bares a huge surface for the entrance and growth of micro-organisms. The anatomical relations and blood supply of the organs have been temporarily altered and an easy portal of infection is presented by the genital parts of the recently pregnant woman.

Puerperal infection shows varied manifestations and, in itself, is not a sufficient diagnosis of a condition whose varied phases require different treatment. The clinical evidences of puerperal infection are those of a rapidly advancing genital infection. The endometrium, in the majority of cases, is the point of entrance of the micro-organisms and their products. Wounds of the perineum and vagina may become infected but, as a rule, the infection here remains local. If the endome



trium is the seat of the infection, the micro-organism spreads into the veins and lymphatics and may gain entrance to the general circulation. This is the common course of streptococcus puerperal infection. In this form of infection, the essential lesion is a peri-uterine lymphangitis. This lymphangitis follows a similar course to the common and well known streptococcus infection of the arm, save that it is modified by the more generous lymphatic and blood supply and an adjacent serous membrane—the peritoneum.

This lymphangitis is more commonly associated with thrombosis than with the presence of actual pus in the lymphatics, which is a result only in severe cases, and accounts for Trendelenberg's<sup>1</sup> findings of thrombosis of the uterine and spermatic veins in 21 out of 43 fatal cases, and lymphatic infection in only four. Grossman,<sup>2</sup> in a study of 51 post-mortem examinations<sup>1</sup> in puerperal infection, found peri-uterine thrombo-phlebitis alone in fourteen instances, and associated with lymphangitis in 13 other cases. However, the frequency of peritonitis, which must be from direct lymphatic extension, shows that the condition is more common than the post-mortem records show. The thrombosis of the peri-uterine veins is a matter of secondary consideration and a comparatively unimportant complication of the disease. The essential lesion is a spreading lymphangitis following the course of lymphangitis elsewhere in the body.

Cuff<sup>3</sup> has recorded a case in which laparotomy was done, of a severe puerperal infection with rigors and very high temperature. There was, on vaginal examination, a mass on the right side of the uterus which proved to be the broad ligament, "the thickness of three fingers stretching from the uterus wall internally to the pelvic wall externally." The ovarian vein was tied and the patient recovered. While assisting Noble of Philadelphia, I saw two such cases of puerperal infection in which the broad ligament was thickened, respectively, to one and to two and half fingers in breadth. Both cases got well after closure of the abdomen without further surgical treatment. There was no abdominal pus in either Cuff's case or the two referred to. This condition is, however, a preliminary state

before peritoneal infection. However, the condition may subside before peritoneal infection results, and become spontaneously cured.

This form of peritonitis is usually streptococcic and is marked by severe clinical manifestations, with little evidence of effort at repair on the part of the peritoneum. The local seat of the disease is about the broad ligaments and the pus is found generally distributed within the abdominal cavity, with little or no evidence of repair in the distant parts. Intestinal paralysis soon follows and the streptococcic form of the disease is almost always fatal. Sargent<sup>4</sup> believes that no recoveries follow this type of peritonitis, but I have seen two cases of general peritoneal infection with streptococcus recover after a simple laparotomy and drainage.

While this type of peritonitis is a most common one in the puerperium, there are other forms in which the infecting organism does not pass through the genital canal, but is the result of the lighting up of a previous focus of infection. Into this class fall all cases of infection from bruising of tumors, rupture of pus tubes, or purulent collections about the adjacent pelvic organs. Any variety of a pelvic tumor may be bruised or have its blood supply cut off by torsion at the pedicle and become inflamed and gangrenous, thus setting up a peritonitis. The important point to recognize is that, in this form, the lymphatics are not involved, and that the treatment is that of a non puerperal peritonitis from a similar cause. However, it frequently happens, particularly in infection from pus tubes, that there may be associated two infections, one of which is of the nature of a lymphangitis, and the other is the old infected focus lighted up. Thus, as occurred in one of my cases, an old purulent gonorrhœal salpingitis may become reinfected with streptococci by lymphatic extension and form pus collections. This may rupture, causing a general peritonitis. In this way it will be seen that it is difficult to make hard and fast subdivisions between lymphatic puerperal peritonitis and peritonitis from previous infection.

While the streptococcus is the most common cause of lymphatic peritonitis, other organisms also have a share in its

production. The streptococcus is the most frequent cause of puerperal infection, and in a previous paper <sup>5</sup> it was estimated to be the causative organism in 40 per cent. of all cases.

In more recent communications on this subject, Lloyd,<sup>6</sup> in 159 cases, says streptococci were found in 33 cases, staphylococci in 30 cases, pneumococci in 17 cases, gonococci in 21, colon bacilli in 22 cases and bacillus capsulatus ærogenes in 2 cases. While these statistics are based upon a study of the infection in the puerperium, it has also been shown that the streptococcus is a frequent cause of infection in premature labor and abortion.

The frequency of the incidence of the various infecting organisms, is shown by the following table of eleven cases, in which they occur in about the usual ratio:

TABLE OF CASES.\*

| Case. | Local Lesions.                            | Character of Peritonitis.                        | Complications.                                    | Organisms.                             |
|-------|-------------------------------------------|--------------------------------------------------|---------------------------------------------------|----------------------------------------|
| I     | Acute hæmorrhagic endometritis.           | Acute suppurative.                               | Acute suppurative endocarditis; septic pneumonia. | Staphylococcus aureus.                 |
| II    | Abortion; acute suppurative endometritis. | Acute purulent.                                  | Acute suppurative salpingitis.                    | Pneumococcus.                          |
| III   | Premature labor.                          | Acute purulent.                                  | Bilateral gonorrhœal salpingitis.                 | B. coli; streptococcus; gonococcus.    |
| IV    | Abortion; gangrenous endometritis.        | Acute purulent, with petechial hæmorrhages.      | Acute yellow atrophy of liver.                    | Streptococcus; B. capsulatus ærogenes. |
| V     | Acute exudative endometritis.             | Acute plastic.                                   | Salpingitis; hydrosalpinx.                        | Streptococcus.                         |
| VI    | .....                                     | General plastic.                                 | Pyosalpinx.                                       | Streptococcus.                         |
| VII   | Purulent endometritis.                    | Acute purulent.                                  | .....                                             | Streptococcus; B. coli.                |
| VIII  | Acute endometritis.                       | Acute purulent.                                  | Abscess of cul-de-sac.                            | Streptococcus.                         |
| IX    | Acute purulent endometritis.              | Fibro-purulent.                                  | Pericarditis.                                     | Staphylococcus aureus.                 |
| X     | Acute purulent endometritis.              | Acute purulent.                                  | .....                                             | Streptococcus.                         |
| XI    | .....                                     | Acute purulent, with multiple local collections. | Bilateral purulent salpingitis.                   | Gonococcus.                            |

\* Some of these cases have been referred to before in other communications. A number of them were studied in the Bender Laboratory and some are from the records of that place. Others were studied at the N. Y. Lying-in Hospital and Kensington Hospital for Women.

These cases show that the streptococcus was the infecting organism alone in 3 cases, and associated with other bacilli in 3 cases. Thus, it will be seen that the streptococcus occupies a greater share as a cause of puerperal peritonitis than it does of puerperal infection in general. Also, Sargent<sup>4</sup> states that, in a study of 258 cases of peritoneal lesions, the staphylococcus albus was found in 108 cases, and he states that this and the colon bacillus form the most important and frequent causative organism concerned in peritonitis, outside of pregnancy. In the cases in which streptococcus was concerned, there were very acute symptoms and marked clinical disturbances. The course was fulminating, and was associated with marked anatomical disturbances in other parts of the body.

Case III, a case of premature labor at the sixth month, showed few symptoms until the seventh day, when there was a high temperature of  $104^{\circ}$ , with abdominal tenderness and rigidity. The uterus seemed well involuted and there was profuse purulent discharge. The physical examination showed a moderate sized fixed mass on the right side of the uterus. No swelling or mass in the cul de-sac. The uterine discharge contained the gonococcus and streptococcus. The leukocyte count at this time was 29 000, with 90.5 per cent polynuclears. On the ninth day after delivery, the patient was taken with sudden severe abdominal pains and marked tenderness and rigidity. The pain was peristaltic in character, intermittent and intense. The tongue was dry and there was slight vomiting. The physical examination showed fulness in the cul de-sac, with marked tenderness and a disappearance of the mass on the right side, leukocyte count was 11,000, with 90 per cent polynuclears. Laparotomy showed general distribution of sero-purulent fluid with marked congestion and redness of the viscera. This is most marked in the pelvic region. The right tube had formed part of the wall of an abscess beside the uterus and pus exuded from the fimbriated end and from the cut surface of the broad ligament. Death occurred nine hours after rupture of the abscess. The gonococcus, streptococcus and colon bacillus were recovered from the abdominal fluid.

Case IV was one of criminal abortion at the seventh month, and was seen five days after labor. The pulse was 140 and temperature 102°. There was slight jaundice. The leukocyte count was 19,000, and the polynuclears 86 per cent. Vomiting was continuous until stupor intervened and increased to coma. The patient died on the fifth day after the operation. The autopsy showed acute yellow atrophy of the liver, with general peritonitis. In the fluid was found the streptococcus and *B. capsulatus ærogenes*.

Case V was one in which streptococcic infection was associated with an old pyosalpinx; this caused an acute peritonitis, more marked in the lower part of the abdominal cavity, but which invaded the upper part as well. There was little pus. The hydrosalpinx on the left side was uninfected.

Case VI was a similar case to Case V, save that the peritonitis was not as acute, and there had been some attempt at repair by adhesions.

Case VII showed general peritonitis with a large amount of pus containing colon bacilli and streptococci. This followed upon an acute purulent endometritis. Death occurred on the tenth day.

Case X was a similar case, being marked by severe vomiting, a high temperature of 105° and intense pain and rigidity. Death occurred on the ninth day.

While the cases of streptococcus infection showed severe symptoms, the cases of infection with staphylococcus aureus also showed acute clinical manifestations with marked anatomical lesions. In this series the staphylococcus aureus was present in two cases.

In the study of puerperal infection, the staphylococcus aureus has been seldom isolated. Fullerton and Bonney<sup>7</sup> have found this organism in one out of 54 cases. Lloyd,<sup>6</sup> in a study of 159 cases, found staphylococcus in 30. The type of infection with this organism seems to be one of great severity, with a tendency toward pyemia and the production of metastatic abscesses.

Such was the result in Case I where, after an apparently

normal pregnancy, the patient was delivered by a midwife. She was seen on the eighth day of the puerperium, profoundly infected. There was marked tenderness and rigidity. Temperature was  $104.3^{\circ}$ . Death occurred on the next day. No operative measures were attempted. Post-mortem examination showed a large quantity of peritoneal pus with a dull injected peritoneum covered with a small amount of fibrin. The pericardial cavity also contained pus. There were areas of septic pneumonia. Bacteriological examination of the organs and pus showed staphylococcus pyogenes aureus.

Case IX was somewhat similar but ran a more prolonged course. The patient entered the hospital on the eighteenth day and succumbed to the profound infection on the same day. Autopsy showed a pericarditis, empyema and general peritonitis with little evidence of repair. The broad ligaments were thickened and firm and there was macroscopic evidence of lymphangitis, pus exuding from the cut surface of the broad ligament. In these two cases, the tendency of staphylococcus infection toward extension to the neighboring cavities and metastatic abscesses is well shown.

Gonorrhœal infection is one of the most common varieties of infection in the puerperium, and is the least frequently discovered. It usually causes little or no rise of temperature, but may cause high fever, serious morbid disturbances and death. Stone and myself<sup>8</sup> found the gonococcus in the lochia of puerperal women in 17 out of 171 cases. This organism was associated with peritonitis in only one case of that series. This is Case III, in which there was a bilateral purulent salpingitis from gonorrhœal infection and, following upon this, lymphatic peritonitis from the streptococcus, rupture of an abscess and general peritoneal infection.

Case XI was one of gonorrhœal infection of the uterus with extension to the tubes and peritoneum. In this case, there was a lesion of gonorrhœal infection before pregnancy, and the disease followed its usual course of rapid extension in the puerperium. The temperature went to  $101^{\circ}$  and the third day of the puerperium, the pulse was 96. The gonococ-

cus was isolated from the vaginal discharge. Pain, rigidity and a temperature of  $103.6^{\circ}$  appeared on the fifth day. On the sixth day, indefinite masses in the abdomen and pelvis were made out on abdominal and vaginal examination. Pulse at this time was 120. Pulse and temperature kept high until the seventeenth day when death occurred. Operation was refused. Autopsy showed bilateral purulent salpingitis and a general peritonitis of some duration. Collections of pus were found encapsulated by intestines and adhesions in various parts of the abdomen. The gonococcus was isolated in pure culture. Mann<sup>9</sup> has reported a somewhat similar case, in which the symptoms came on the tenth day. Temperature was  $107^{\circ}$ , pulse 120. Death occurred and the post-mortem examination showed a peritonitis from pure gonococcus infection.

Gonorrhœal infection usually extends by direct continuity of mucous membrane, but may, in the soft condition of the genitalia, penetrate the uterine muscle and extend into the broad ligament. Salpingitis is a frequent complication of this infection in the puerperium, as is shown by the study of Stone and myself,<sup>8</sup> in which we found clinical evidence of extension of the infection beyond the uterus, in 7 out of 17 cases. This extension of the disease may continue, as in Cases III and XI, to cause a peritonitis which is, however, usually localized in the cul-de-sac. The late complications of gonorrhœal infection are more to be feared than is the earlier uncommon general peritonitis. Salpingitis and pelvic peritonitis are the most common results. This is the cause of "one child sterility."

Pneumococcus infection is one of the more uncommon forms of puerperal peritoneal infection, and one of comparatively slight severity, save in isolated cases, as in Case II. This condition resulted in a woman four months pregnant, following an induced abortion. She was seen five days after the induction and was curetted for retained secundines. The pneumococcus was isolated from smears and cultures taken at the time of curettage. The temperature was 102 and continued high until death three days afterwards from peritonitis.

Post-mortem examination showed all the peritoneal sur-

faces to be covered by a sticky, greenish-yellow purulent exudate which was thin between the adherent intestines, but thick between surfaces held apart by collections of fluid. All the dependent parts of the abdomen contained yellowish turbid fibrino-purulent exudate. There was an acute suppurative salpingitis and endometritis. The pneumococcus was recovered from the peritoneal exudate.

While pneumococcus puerperal infection is uncommon, a number of cases have recently been reported. Weichelbaum<sup>10</sup> as well as Bar and Tissier,<sup>11</sup> have reported cases, and Cohn *one similar to this*. Fullerton and Bonney<sup>7</sup> found six cases of pneumococcic infection in 54 cases of puerperal fever, and Lloyd<sup>6</sup> found the pneumococcus in 17 out of 159 cases of puerperal infection. The pneumococcus is being more frequently isolated in such conditions, as the bacteriological methods of study improve. That the condition is by no means rare as a cause of infection of the peritoneum, is shown by Annand's and Bowen's<sup>12</sup> collection of 91 cases of pneumococcus peritonitis in children. They found that in half the cases the pus was encysted and that the peritoneal infection was usually secondary to some remote pneumococcal lesion. The exhaustive discussion by Jensen<sup>13</sup> of this form of peritonitis, gives a thorough idea of the subject. He reports several very interesting cases and gives a list of 143 references.

The character of this form of peritoneal infection is usually that of Case II, reported here. The infection is characterized by a plastic exudate, very rich in fibrin, which causes adhesions and encapsulation of the exudate, quite rarely, in the severer forms, the entire mass of the intestines adhere together and are surrounded by pus. In typical cases, the clinical picture is quite striking, the onset is that of an acute peritonitis, followed, very soon, by a chronic stage with mild symptoms and indefinite masses on abdominal palpation. The diagnosis is never certain without bacteriological examination, although one might suspect this infection from the thin, odorless, greenish yellow pus and the abundant fibrinous adhesions. The prognosis is, as a rule, favorable, but recovery without



operation is rare. Simple evacuation of pus and drainage of the collections are all that is usually required.

There is, in this series of cases, no instance of peritoneal infection resulting from direct traumatism or necrosis of a tumor from pressure or torsion of the pedicle. A fibroid or ovarian cyst may take on rapid growth during pregnancy, and from torsion of the pedicle or sudden loss of nourishment from lessening of the blood supply after labor may become necrotic and infected. Lepage and Mouchotte<sup>14</sup> have collected a number of such cases. Similar causes lead to infection from ovarian cysts; and Getter<sup>15</sup> has reported 21 cases where, in spite of normal labors, infection of the cyst has occurred and led to fatal peritonitis. The infection is commonly due to the colon bacillus and is usually widespread and severe. Lawrence has reported ten such cases sent to the hospital as peritonitis following a puerperal genital infection. Patton<sup>17</sup> has collected 321 cases of ovarian cysts in pregnancy. In 95 cases treated expectantly until labor, torsion of the pedicle occurred 29 times—4 times during labor and 25 times during the puerperium. Rupture happened 13 times—3 before and 10 after or during labor. There were 25 deaths in the 95 cases, only 4 of which occurred in patients who had operations after labor, and 21 in those who were treated wholly expectantly. General peritonitis occurred in 7 of the 95 cases. There were 184 cases treated by operation, with a mortality of 8 (4.3 per cent.). Infection of ovarian cysts is especially likely to happen in the early puerperium. The teratoid ovarian tumors are particularly liable to be aroused from quiescence to rapid growth during pregnancy. This is well shown by a review of 35 cases by Neuhauser.<sup>18</sup>

Appendicitis is another lesion which may cause an extensive and fatal form of peritonitis in pregnancy and the puerperium.

The lessened resistance to infection of the pregnant woman has added to it the local abdominal disturbances of the presence of the mass of the gravid uterus and the increased vascularity of the pelvic viscera. Futh,<sup>19</sup> in his recent papers, up-

holds Waldeyer's statement that the cæcum and appendix are pushed up during pregnancy. This displacement begins about the fourth month, when the uterus rises out of the true pelvis. It then opens up the broad ligaments and the ovarian vessels are enormously increased in size. This elevation of the cæcum is of clinical significance as, in addition to predisposition to disease by reason of the alteration of position, the focus of inflammation is thereby placed in a more dangerous position—*i.e.*, higher in the abdomen, where adhesions are more easily torn and where inflammatory processes spread with greater ease. The cæcum returns to its proper place after labor, but, if the appendix is adherent to the uterus or adnexa, it is dragged into the true pelvis by the involution of the uterus. This may cause rupture of an abscess and increase the extent of the inflammation to the general peritoneum.

Seven casts of the abdominal cavity of women, dying during pregnancy, are described by Futh<sup>20</sup> to uphold this view. Five cases of appendicitis in pregnancy are also reported, and he states that appendicitis is much more dangerous after the fourth month, on account of the size of the uterus influencing the position of the cæcum. He has divided Boije's series into two groups. In the first, under four months, there were 10 cases, with three deaths. In the second, from the fourth to the ninth month, there were 32 cases with 19 deaths—a much higher mortality. This seems to be clear proof of the effect of the continuance of pregnancy upon the mortality of this condition. Hlawecek,<sup>21</sup> in 1897, collected 13 cases of peritonitis from this cause with 11 deaths, but under early operative treatment, the prognosis is brighter.

The diagnosis of generalized peritonitis in the puerperium is by no means easy. The extension of an infection in a woman already severely infected, shows few additional symptoms and small increase of pathognomonic signs. The diagnosis of puerperal genital infection is in itself not always easy, and the presence of pathogenic micro organisms in the lochia is not proof of infection. Bumm and Sigwart<sup>22</sup> found that, by very careful examination, the streptococcus was isolated in the

vaginal discharge of 38 per cent. of women in the later months of pregnancy. Leo,<sup>23</sup> in an examination of the lochia in 38 normal women, in the puerperium, found the streptococcus in the vagina in 50 per cent. and in the uterine lochia in 17.6 per cent. In the later days of the puerperium, streptococcus is more commonly found, as was shown by a study of Schenk and Schieb,<sup>24</sup> who found this organism four times more frequently late in the puerperium than at the beginning. They found that streptococci existed in the lochia of one-third of all normal women. Also the discovery of a certain organism in the vagina, although an indication is not pathognomonic of the cause of infection. Sargent<sup>4</sup> reports a case of gonococcus infection found in the vagina while the peritoneum was infected with the pneumococcus. Stone and myself<sup>25</sup> have shown, in a study of the gonococcus, that this organism may exist in the uterine lochia without causing temperature. However, the presence of certain bacteria in the uterine lochia, as shown by smears and cultures, is some indication of the cause of infection.

The time at which the extension of the infection to the peritoneum occurs seems to be very variable. Lymphatic peritonitis from streptococcus usually appears from the third to the tenth day of the puerperium. It is seldom earlier but often later. The time of onset of symptoms of peritonitis from previous lesions also varies within a wide limit, but is usually later in appearance than the lymphatic form.

Pain is usually a prominent symptom, and occurred in all my cases. The pain of peritonitis is, I believe, fairly characteristic, and is a great aid in the diagnosis of the condition. It depends upon two conditions: First, it is now recognized that most of the pain in peritonitis is due to an accompanying lymphangitis. This, in part, causes the crampy pains of peritonitis—the lymph vessels of the intestines press upon the sensory nerves as the lymphangitis extends. The pain in the lymphatic peritonitis is not usually localized, as in appendicitis, but is sometimes referred, like that of appendicitis, to the epigastrium. This is supposed to be due to the infection in the peri-lymphatic tissue and the lymph glands around the aorta.

There seems to be but little pain from lymphangitis of the broad ligament

The second source of pain is from the exterior of the gut itself, and is due to the presence of an irritant causing an inflammation of the peritoneum. The movement of the intestine causes severe crampy pains. That this pain is due somewhat to the irritant, and not directly to the inflammation, is shown by a case of abdominal hæmorrhage following Cæsarian hysterectomy upon which I did a laparotomy to control the bleeding. After clean hysterectomy there was a sudden flow of blood into the peritoneal cavity. The patient, who had been resting quietly, immediately complained of intense pain in the epigastrium and in the diaphragmatic region, generally. There was difficulty in breathing and nausea. The pain was intermittent and intense. Immediate laparotomy showed that the unclotted blood was generally distributed throughout the abdominal cavity. The character of the pain was similar to that of Case III, in which there was a sudden rupture of a pus collection, causing intense intermittent pain crampy or peristaltic in character. In addition to the direct irritation and inflammation of the peritoneum the pain is further caused by the rubbing of the inflamed intestinal covering against the parietal peritoneum. The visceral serosa has comparatively few sensory nerves while the parietal peritoneum is exceptionally well supplied. The pain in the diaphragmatic region, in the two cases cited, was probably due to irritation of the parietal serosa in the area. It is also recognized, however, that peritonitis may exist in the center of the belly, beneath the colon and above the pelvis amongst the coils of the small intestine, for some time and become widespread without causing marked pain.

That acute abdominal symptoms may be caused by a lymphangitis alone, is shown by a report of Rowland,<sup>26</sup> of two cases of operation upon supposed perforation in typhoid fever. Masses of enlarged lymphatic glands were found in the mesentery of the gut without any evidence of perforation or peritonitis. The pain was intermittent and peristaltic. There was

localization of the tenderness with little or no rigidity. Armstrong<sup>27</sup> has reported a similar case in typhoid fever; and McCrae,<sup>28</sup> in his study of the pain in typhoid fever, cites two cases in which the explanation for the acute symptoms was the enlarged mesenteric glands.

In peritonitis, while the intestines are quiet, pain is not usually a marked feature; but, during peristalsis, it is usually present. For this reason, it is often useful for diagnostic purposes to set up peristalsis and elicit the pain by giving a purgative enema. This usually also gives a clue to the location of the point of greatest inflammation.

Rigidity is usually an early and trustworthy sign. It is present in all cases of peritonitis which were seen at their inception. It was present in the 7 cases of localized gonorrhœal peritonitis, before referred to. Rigidity, however, depends, in some measure, upon the suddenness of the onset of the peritonitis and sometimes does not last long. Intestinal distension usually overcomes it and causes it to disappear. To the educated hand of the surgeon, it is the most reliable early symptom.

Tenderness on palpation is not usually a marked symptom unless there has been marked effort at repair and the formation of much exudate and many adhesions. It may sometimes be produced vaginally by movement of the uterus. It can also be elicited after peristalsis has been set up.

Vomiting is a fairly constant symptom and occurs at two different periods in the disease. First, at the onset, there is usually vomiting, regurgitative in character, and later there is more persistent bile-stained vomiting, often fæcal or hæmorrhagic in character.

The temperature was rather variable in character. In the infection with the more virulent organisms, it went very high and was intermittent in character; but in the last days of the disease, this intermission was not present. In the less virulent infection by gonococcus and pneumococcus, the temperature while high, did not rise above 103°. The pulse in these two instances was also lower than in the more virulent

form. There was, however, nothing characteristic about the less virulent peritonitis. In Case III, after rupture of the abscess, the pulse suddenly rose from 90 to 120 and became of high tension and thready. The pulse is usually a better indication of the condition of the patient than is the amount of fever.

The blood changes of general peritonitis are interesting and instructive. There is usually a diminution in the red cells. This is more marked in puerperal peritonitis, and, in puerperal infections generally, than in infection in the non pregnant. The leukocyte count is increased as it is in all septic conditions. This depends upon many conditions as the patient's resistance and the virulence of the infection. It may be said that, as a general rule, in streptococcus infection the leukocyte count is less in the pregnant than in the non pregnant. A sudden fall in the leukocyte count (as in Case III, from 29,000 to 11,000) is suggestive of an overpowering of the system by toxins of the infective organisms. The polymorphonuclear leukocytes are usually increased in percentage.

Iodophilia is another useful sign and gives reliable evidence in all septic conditions. After staining with weak solution of iodine (Ehrlich's method), the blood, in cases of septic infection, usually shows a reaction in the cytoplasm of the leukocytes. This iodophilia usually occurs in the polymorphonuclear neutrophile cells and sometimes in the lymphocytes. It does not bear a definite relation to the leukocytosis, but depends upon the amount of toxæmia not upon the leukocyte range. Thus the blood of a profoundly septic person may show intense iodophilia with a fall in the leukocyte count, while a high leukocytosis without iodophilia, is not incompatible with an infection exciting a toxæmia sufficient to stimulate the cells to overproduction, but not of a character to affect them structurally. This fact makes the reaction especially valuable in cases of puerperal peritonitis, where there is often sudden overpowering of the system by toxins. An interesting review of the work of Cabot, Locke,<sup>29</sup> Dunham,<sup>30</sup> Dunn<sup>31</sup> and Keen<sup>32</sup> upon this subject is given by Da Costa,<sup>33</sup> with a report

of 100 cases, including 30 cases of sepsis in which the iodophilia was present.

It must be remembered, however, that the diagnosis of peritonitis can never depend upon the blood changes which only give confirmative evidence of infective processes. No hard and fast rule in regard to the degree of leukocytosis can be laid down, in spite of efforts of some of the camp followers of scientific investigation to have us diagnose our cases of sepsis in their private laboratories.

The bacteriology of the blood and lochia is of importance in forming an exact idea of the extent and character of the infection. Smears of the uterine lochia often give immediate and useful information in regard to the possible cause of the peritonitis.

Careful physical examination should be made upon all cases of suspected puerperal peritonitis, as it is the exception and not the rule for all patients with severe puerperal peritonitis to be without complications and infection in other organs. Care should be taken to recognize lung and heart complications, and search should be made for metastatic collections. Pyelitis and pyonephrosis are also not uncommon results of infection in pregnancy. The use of the Pravaz or Hollenbeck <sup>34</sup> needle has been suggested for the detection of free pus in the abdominal cavity, but should be used with great care, as there may be adhesions which would cause the bowel to be punctured.

The treatment of uncomplicated puerperal peritonitis is that of peritonitis in the non-pregnant. Immediate laparotomy and evacuation of the purulent matter with removal of the focus of infection, if possible, is recognized by all surgeons to be the proper procedure. While this is true in all cases in which peritoneal infection has resulted from previous foci as pus tubes, abscesses or necrosis of tumors, there is more difference of opinion as regards the value of operation and the procedure in lymphatic peritonitis.

Trendelenberg has advised, in this condition, resection or ligation of the veins of the broad ligament. It is decidedly

questionable whether this operation has any great value as cases are noted in which recovery has taken place after simple laparotomy. The thrombosis of the veins is merely an incident of the infection and offers no excuse for the laceration of the broad ligament and the division of the lymphatic channels to allow the escape of micro organisms. Hysterectomy an operation which has been practically abandoned unless there is a local lesion has more *raison d'être* for it removed a greater part of the infected surface and allowed of better drainage.

In order to thoroughly discuss operative measures in the lymphatic form of general puerperal peritonitis a proper knowledge of the processes of infection with the most common causative organism the streptococcus is necessary. Streptococcus infection differs from most other infections in that the blood serum does not acquire streptococcal properties but the destruction of the cocci and relief from the infection is brought about by the leukocytes. There is a relatively small amount of toxin developed and no bactericidal properties in the serum and it is reasonable to suppose that phagocytosis is an important factor in recovery. In addition to a leukocytosis there must be an increase in the opsonin i.e. an increase in the power which prepares the leukocytes to engulf the bacteria. Any substance then which aids the body defenses to resist the infection is of use.

Anti streptococcic sera have been tried for many years with poor results but recent reports show that properly prepared polyvalent serum has given more satisfaction. Bumm<sup>35</sup> reviews his results in 32 cases of severe infection and in four particularly striking cases of high fever but without phagocytosis. Hyperleukocytosis occurred 12 hours after the injection of the serum and was intense the leukocytes incorporating the streptococci with great avidity. Rau<sup>36</sup> has reported similar good results and a reduction of his mortality from 60 to 36 per cent in streptococcus infection. Escherich<sup>37</sup> has also reported beneficial effects in scarlet fever with the Moser polyvalent serum. Anti streptococcus serum is however more of a prophylactic measure against peritonitis and it is doubtful



whether it has much effect after the infection has passed the confines of the uterus. It should, however, be used.

Other substances, however, are used to enhance the resistance of the peritoneum and to increase the activity of the leukocytes. Mickulicz<sup>38</sup> used intra-peritoneal injections of nucleic acid and performed operations as soon as the leukocytes began to increase. In 45 cases, the increase varied from 9 per cent. to 452 per cent. Seven cases died, but none from peritonitis, although two recovered in spite of this complication. Diez<sup>39</sup> also used nucleic acid and advocates the injection of a 2 per cent. solution as a preliminary to operation.

Hanner<sup>40</sup> reports 51 cases in which 50 c.c. of the same acid was injected in the form of sodium nucleate 13 hours before operation. Marked hyper-leukocytosis was present in every case. The reaction was always striking, the temperature rising one to two degrees C., with a chill in some instances. He also, as did Gray,<sup>41</sup> used quantities of dead organisms as vaccine, but the effect was doubtful.

It would, therefore, seem that the injection of nucleic acid is a useful adjunct to early operation in generalized peritoneal infection, particularly in infection from the streptococcus.

Operation should remove, if possible, any focus of infection with as little traumatism and handling of the intestines as possible. Lavage should not be performed, as the risk of spreading the infection is too great. The treatment should be after the method of Murphy and consist of making a small opening with the introduction of drainage tubes. Vaginal drainage is often useful. Evacuation of the intestinal contents in cases with paralyzed intestinal walls is sometimes of use. A high rectal tube may answer when the sigmoid is involved. If paralysis be higher than this, enterostomy is necessary.

Peritonitis characterized by abundant sero-purulent exudate and unaccompanied by signs of deep inflammation is a comparatively benign affection provided that operation is timely; but that form characterized by little or no exudate and with the gut wall red, dry, distended and paralyzed, gives an almost hopeless prognosis.

The prognosis, as a whole, in puerperal peritonitis is bad unless early operation is done. However, results are improving, as is shown by 121 cases collected by Jeannin<sup>42</sup>. These histories extend back to the early days of abdominal surgery, yet there were 60 recoveries and 61 deaths. This showing will be improved with more modern methods of treatment and earlier operation. In cases of puerperal general peritonitis treated expectantly, the result is almost invariably fatal, while in those cases treated surgically there are frequent successes, hence every case of puerperal general peritonitis should be operated upon as soon as diagnosed.

In the after-prognosis of such severe puerperal infections, it should be kept in mind that the late appearance of metastatic abscesses is not an uncommon condition.

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## SUBACUTE PERFORATION OF THE STOMACH AND DUODENUM

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THE condition of "subacute" perforation of an ulcer in the stomach or in the duodenum is one which has received less attention than it merits. It is not infrequent, it is of great interest, and its discrimination from "acute" perforation is of no little importance from the therapeutic standpoint. Since attention was first called to it, only one paper, so far as I am aware, has dealt specially with it, this paper was written, with characteristic ability, by Dr F B Lund, of Boston (*Boston Med and Surg Journ*, 1905, vol 1 p 516)

I find that in all I have operated upon 15 cases, 5 of which were dealt with in the early stage, 10 after the lapse of months or years, in 4 an hour glass stomach was found

In subacute perforation of the stomach there is a sudden rupture of an ulcer, an ulcer which, without exception in my experience is of the "chronic" type. The chronic ulcer with its deep excavation, its deep edge, and its surrounding induration has eroded the walls of the stomach little by little, until finally and abruptly the thin barrier between it and the peritoneal cavity is broken through. The conditions are, up to this point and in these particulars, in no way different from those existing in "acute" perforation. But whereas in the latter form the rupture is of fair size and at once allows the contents of the stomach to spread themselves freely over the general peritoneal cavity, and to cause there a universal infection (though the path followed is often recognizable, and can not seldom be predicted), in subacute perforation there is, by one agency or another, a definite localization of the fluids escaping from the stomach, and in many instances a narrow circumscription of the peritoneal response to their invasion

It becomes, therefore, a matter of interest to know the circumstances under which this limitation is affected. I have seen examples of the following:

(1) An empty condition of the stomach. In "acute" perforation the stomach is often full; the rupture of the ulcer, it is frequently remarked, occurs soon after a meal. If the stomach be empty, say 5 or 6 hours after a meal, perforation may still occur, but there is, of course, little or no escape of contents.

In such circumstances, the ulcer may be ruptured by a violent strain, a sudden movement, or a severe shake. It is not long before a most vigorous defence is made by the peritoneum, lymph is thrown out copiously in flakes, and a thin serous fluid begins to fill the peritoneal cavity. The escaping contents of the stomach being small in quantity and feeble in bacterial activity, are rapidly circumscribed.

(2) The plugging of the opening in the ulcer with a tag of omentum. Of this, I have seen one perfect example. The ulcer was close to the pylorus, its opening small; into this opening there fitted, as accurately as any cork, the bulbous end of a thin omental tag which came upwards from the greater curvature of the stomach. There was not any adhesion of the stomach to the abdominal wall, or to the overhanging liver; nor was there need for any, for a more perfect plugging of an opening could not be conceived. The little omental tag seemed quite to have grown into the opening which it so securely closed.

(3) The opening may be sealed over by layers of plastic lymph. When the abdomen is opened, a clear or slightly turbid fluid is found, but no ulcer is apparent. At some part of the stomach wall a thick adherent mass of plastic lymph will be seen, as thick as wash-leather, and in appearance very similar. On peeling this off, a small perforation is found, from which a bubble may be squeezed. This condition may be a later stage of that already referred to (No. 1), but it is equally possible that as the ulcer deepens, the peritoneum is irritated, and protectively deposits layer after layer of lymph upon the outer

side of the base of the ulcer, so that when the final dissolution of the stomach wall occurs there is already a barrier almost or entirely impenetrable, to check the escape of the stomach contents

(4) The stomach becomes adherent at the base of the ulcer. The adhesion may be to the anterior abdominal wall, to the under surface of the liver, or to the pancreas. Other points of adhesion are recorded, but they are unusual and I have not met with them.

The adhesion to the anterior abdominal wall is the most frequent, as would be expected from the usual position of perforating ulcers in the stomach. It is possible that adhesion of the ulcer is only a later stage of No. 3, the plastic lymph becoming welded on its outer side to an adjacent firm structure, and that as the ulcer deepens, the lymph is digested until the actual base of the ulcer is formed by the muscles of the abdominal wall, by the pancreas, or by the liver.

At the place in the abdominal wall where this adhesion occurs, a tender and resistant area can readily be distinguished, and a diagnosis of the condition made with confidence. In one patient whose ulcer had perforated "subacutely" years before, the base of the ulcer was formed by the posterior sheath of the rectus, and a hard mass had formed at this point. A diagnosis of malignant growth had, not unnaturally, been made. (See Case XV)

### SYMPTOMS

In every particular save one, that is intensity, the symptoms are the same in subacute as in acute perforation. There is a sudden onset of pain, severe, and almost intolerable, but measurably less than in acute perforation. The pain comes almost without exception in those who have suffered for years or months from the usual symptoms of gastric ulceration. There are some cases in which there has been a notable exacerbation of pain in the days preceding the rupture, and patients have explained to me that the body or side felt stiff, and sore that laughing or stretching, as in reaching up to a high shelf

caused great discomfort. (See Case II.) These inaugural symptoms of perforation are important, and if the practitioner chances to hear of them from a patient whom he knows to have an ulcer in the stomach, he should accept them as undoubted evidence of impending perforation. In my own experience perforation of an ulcer has never occurred without a previous history of gastric ulcer being given. The pain is sudden in onset, and may be followed rapidly by vomiting, prostration and possibly (though rarely) by collapse. The abdomen on examination is everywhere tender. A careful examination may reveal an especially tender and resistant area. A patch 2 or 3 inches in diameter may be excessively sensitive, and on palpation it may seem as though a flat hard disc had been inserted in the abdominal wall.

The symptoms abate slowly. The pulse does not increase, its character improves, vomiting ceases; the abdomen which was hard and retracted at the first, may become supple except at the one spot, or it may be a little distended, and free fluid may possibly be recognized. The patient's condition may indeed, at this stage, be so satisfactory, as compared with the initial condition, that the diagnosis may be in doubt. If indeed morphine has been given, as it still very often is, in repeated doses, the aspect of the patient may be little different from the normal. If no operation is practised at this time, there are three directions which affairs may take; either a perigastric abscess may form, or a secondary rupture into the general peritoneum may occur, or the adhesion of the ulcer to the abdominal wall or liver or pancreas may become firmer, the acute inflammatory conditions subside, and the patient live for years with a chronic ulcer whose base is formed by one of the structures already mentioned. Of the three I believe the last to be the most common.

#### DIFFERENTIAL DIAGNOSIS.

The conditions likely to be confused with subacute perforation of the stomach or duodenum are few. The chief difficulty in diagnosis arises in discriminating a subacute perfora-

tion near the pylorus, from a condition of cholecystitis. In both, there are pain, sudden in onset, severe, possibly colicky, in neither is there any general invasion of the peritoneum, in both a localized peritonitis with a tender resistant area is recognized. The previous history may afford a clue, but is not likely to do so. Lund, in the paper already mentioned, gives notes of a case in which it was considered possible that a perforation of a malignant growth in the colon had occurred.

In one case of subacute pancreatitis which went on to the formation of an abscess, from which I removed a large slough of the pancreas, I had diagnosed a posterior subacute perforation of the stomach followed by subphrenic abscess. This mistake is one which, from clinical signs alone it would be difficult to avoid.

In my own cases a correct diagnosis was made without difficulty in almost every case.

#### TREATMENT

If the patient is seen at the time of the onset of perforation, I think there can be no hesitation in advising instant operation. In the first place accurate and unequivocal discrimination between acute and subacute perforation cannot be made, and by delay valuable time may be lost. Moreover, though it is true that many of the subacute cases with rest in bed, abstention from food and so forth, may progress to the chronic stage, there are indubitably other possibilities, which, when reckoned with, make early operative treatment the safe and prudent course. In all the cases I have seen in the early stage, save one, I have operated and have cleared the ulcer of adhesions, infolded it, and occasionally sutured a flap of omentum over the line of stitches. I did this at first because I did not distinguish between the acute and the subacute cases, I did it subsequently because it had seemed to be the right course to have pursued in the early cases. Dr. Lund has, however, suggested that since the perforation is already sealed off, there is no need to expose and then close the rent afresh, and that, accordingly, the proper course is to perform gastro-enteros-



tomy forthwith, leaving, if possible, the ulcer and its secure barriers untouched. He writes:

The treatment of an open perforation is manifestly to invert the edges of the ulcer and close it by suture. The ulcer has already perforated into the general cavity and the peritoneum is soiled. In these subacute perforations, however, nature has already closed the perforation, and if we can get along without tearing the adhesions, opening up the ulcer and soiling healthy peritoneum, we give our patient a distinctly better chance. In case the ulcer is on the anterior surface or lesser curvature and is to the right of the median line, and the adhesions are to the inferior surface of the liver, there is nothing to prevent our turning up the posterior surface of the stomach and performing a posterior gastro-enterostomy without breaking up the adhesions, opening the ulcer, or soiling the cavity with stomach contents. We provide internal instead of external drainage for the ulcer, and we operate in a region where the peritoneum and gastric wall are healthy instead of inflamed, and where our opportunity of getting perfect healing is the best. And last, but not least, we give the best treatment to the underlying condition of chronic ulcer to which the perforation has been due.

This I believe in some cases, more especially those in which the pyloric part of the stomach or the duodenum are involved, will prove to be the best practice. In other cases, however, in those for example where the ulcer is on the anterior wall of the body of the organ, and a wide area is covered with lymph, and adherent, I think that the exposure and suture of the perforation, followed or not by gastro-enterostomy will be the proper course to adopt.

In those cases where years have elapsed since the initial catastrophe, a separation of the ulcer from its adhesions is certainly unnecessary, and is probably most undesirable. For these, gastro-enterostomy is the operation to be advised if the pyloric part of the stomach is involved. If the cardiac end of the lesser curvature is involved, gastro-enterostomy is here also desirable, but a separation of the ulcer, if readily performed, is also good practice.

In four cases I have found an hour-glass stomach, the ulcer at the isthmus of the organ being firmly fused to the anterior abdominal wall. On separating the stomach an opening was found in its walls, and it at once became clear, that the base of the ulcer had actually been formed by the abdominal wall itself.

The following are the notes of all the cases upon which I have operated. They may be divided into three classes. In the first, Cases I to XI, the operation was performed when the perforation was recent. In the second, Cases VII to XI, when the perforation was of old standing. In the third, Cases XII to XV, when an hour-glass stomach was present.

#### CLASS I RECENT SUBACUTE PERFORATION

*CASE I—Recent Subacute Perforation of an Ulcer on the Anterior Wall of the Stomach.* A female patient, aged 24, seen March 13, 1902. Had been married 8 weeks previously. Before that she had suffered slightly from indigestion, but never severely. Thirty-six hours before operation she was suddenly seized before breakfast with acute pain beneath the left costal margin. There was no vomiting (the stomach probably being empty, after a night in bed, the last meal being supper the night before), faintness and collapse were present. The abdomen, which was generally tender, became gradually distended and on examination was thought to contain free fluid. In the upper left quadrant of the abdomen, beneath the outer part of the rectus, was an area which was very acutely tender.

When the abdomen was opened through the left rectus muscle a thick localized deposit of yellow plastic lymph was found over an area about 2 to 3 inches in diameter. On peeling this off, a small perforation almost pin-point in size, was seen, it was in the middle of a hard and indurated area the size of a shilling. When sutures were passed to infold the ulcer they cut through at once, so that a fairly large area had to be infolded by sutures that were not tightly drawn. Over the suture line, a broad flap of omentum was turned and fixed by two stitches. There was a fair quantity of perfectly clear, slightly yellow inodorous fluid in the abdomen. The abdomen was closed. Re-

covery was satisfactory. In July, 1905, the patient was quite well, and had borne two children.

CASE II.—*Recent Subacute Perforation of the Stomach.* The patient, a girl aged 18 years, was seen November 8, 1902. For the last few weeks she had had some slight pain after food just beneath the left costal arch. The pain had been worse when she laughed and when she stretched her left arm upwards. There was a sudden onset of symptoms about 8 P.M. on November 7—pain, collapse, shallow breathing, etc. The abdomen was intensely rigid and immobile. The perforation was about equal in size to a lead-pencil and was situated near the lesser curvature towards the cardia. There were many flaky adhesions covering the perforation completely and sealing it off. A little clear fluid in the peritoneal cavity. The ulcer was sutured and an omental flap was turned over it. There was no drainage. The patient recovered. Reported to be quite well in June, 1905. In domestic service.

CASE III.—*Recent Subacute Perforation, Followed by a Second, Separate Acute Perforation of the Stomach.* A woman, aged 23 years, was seen March 5, 1903. She had had indigestion for several months. On March 1, when in London, she had a sudden attack of pain beneath the left costal margin; she felt faint and prostrate, and vomited. She gradually felt better and on the 3rd traveled from London to Bawtry and ate a good luncheon on the journey. The side then felt "stiff" and hurt her if she laughed or turned quickly. On the 4th after breakfasting she had a sudden extremely severe pain, with collapse and vomiting. The abdomen had gradually distended and was now blown out and tympanitic; a fluid wave was easily felt. The patient looked very ill. The pulse was 156. Two perforated ulcers were found, both on the anterior surface and in the cardiac half of the stomach near the lesser curvature. They were distant about one and a half inches from each other. One opening was of the diameter of a lead-pencil and the other of a knitting needle. From both, fluid gushed out. Both were closed by suture and the stomach was folded over. The omental lid afterwards covered both in. Drainage was effected by a split tube and a gauze wick at the upper part of the incision and through a separate suprapubic incision. Recovery ensued. Gastro-enterostomy subsequently performed. Quite well in 1905.

**CASE IV—Recent Subacute Perforation of the Duodenum.**  
*Enormous Deposit of Plastic Lymph* The patient was a girl, aged 17, who had suffered for twelve months from indigestion, and for years from anæmia. Four days before I saw her she had a very severe attack of pain in the right side and across the abdomen, vomiting and faintness. When the abdomen was opened there was a little clear fluid and around the duodenum a very thick tenacious plastering of all the parts with lymph. This was wiped away with rough gauze, the process requiring time and patience. Eventually a minute duodenal perforation was found about 1 inch beyond the pylorus. The ulcer was infolded, and the abdomen drained in front and behind. The patient recovered, and was reported well in March, 1906.

**CASE V—Recent Subacute Perforation of Duodenum.** A man, aged 22, was seen May 11, 1904. He had been quite healthy up to beginning of April, 1904, when he felt a slight pain in the abdomen. This only lasted a few minutes and then passed off. Three weeks later he was seized with extremely acute abdominal pain. Within three minutes he was in a state of complete collapse. The pain was most severe in the epigastric region at first, later it was most acute in the lower part and in two or three days it settled in the right iliac region. He vomited at the beginning not again later. There was slight constipation. He recovered very rapidly. He went out for a stroll on the ninth day. Incision made over appendix. Appendix found lying along outer side of ascending colon and adherent in all its length. It was removed. The hand passed up into the liver region felt numerous adhesions. A second incision was made over the gall bladder. Numerous recent adhesions of the gall bladder to liver and duodenum were separated, also a very strong one between the duodenum and under surface of the liver. On examining the surface of the duodenum thus bared, a minute perforation was seen. This was occluded by Lembert sutures and abdomen closed. The patient recovered. In June, 1905 reported to be quite well.

**CASE VI—Recent Subacute Perforation.** March 24 1904, female, aged 25. Indigestion twelve years. For many years she had had acid eructations and for the last two years has vomited after food. She has had many severe attacks of pain in the epigastrium. Four days before admission and again one day before she had attacks of pain and vomiting, but not any more.

acute than many she had had before. During the last three years her weight has dropped from 9 st. to 5 st.  $8\frac{3}{4}$  lbs. At the operation, perforation, the size of a small pea, was found in the upper part of the first portion of the duodenum. The ulcer was about the size of a half-crown. There was severe local plastic peritonitis, but no general infection. The perforation was closed by Lembert's sutures, and a posterior gastro-enterostomy performed. The patient recovered. She was sent by Dr. Rowling. Report received from Dr. Rowling June 26, 1905: "Gained  $2\frac{1}{2}$  st. in weight during the three months succeeding the operation."

## CLASS II. OLD SUBACUTE PERFORATION

CASE VII.—*Old Subacute Perforation.* June 4, 1902; female, aged 27. Five years ago had an acute attack of abdominal pain, vomiting, etc. Was in bed 22 weeks. The doctor who saw her and the consultant, diagnosed "perforating" ulcer of the stomach. Constant indigestion, pain, and vomiting since then; can never take solid food, and ordinary liquid diet causes pain and uneasiness. Vomits every three or four days now. Stomach moderately dilated. At the operation, very dense and numerous adhesions were found on the posterior surface of the stomach, especially thick and tough near the pylorus, where the stomach was almost fused to the pancreas. A fairly large stomach. Posterior gastro-enterostomy. The patient recovered. The patient was seen with Dr. Millhouse and Dr. Anning. Since the operation the patient has had three serious attacks of her old trouble, apparently, each one less severe than the preceding one. Since August, 1904, she has had no symptoms of a return, and to all appearances the cure is complete. Her appetite is good, and she eats the food usually going in the house without any ill effects. Weight at the time of operation, 6 st. 6 lbs., and on July 6, 1905, 8 st. 1 lb.

CASE VIII.—*Old Perforation, Probably Subacute.* September 16, 1902, female, aged 37. Has had indigestion for "many years." Eighteen months ago she had "perforated gastric ulcer" of the subacute type, diagnosed by Dr. Bishop. Since then her stomach symptoms have been intolerable. Pain constant and gravely increased by food of any kind; vomiting at least every other day, fermentation and eructation of obnoxious gas. She has vomited frequently half a chamber-utensil full of

sour semi digested food She has "lost a lot of flesh" The stomach is very large, obviously standing out on her thin abdomen The washing out required 49 pints before the fluid returned clear Free HCl At the operation, the stomach was found buried in adhesions to both anterior and posterior surfaces The whole outline of the stomach was warped The posterior surface was exposed with some little difficulty owing to adhesions to transverse mesocolon and to the pancreas It was probably here that the perforation had occurred Posterior gastro enterostomy was done I was dissatisfied with the way in which the anastomosis seemed to "sit" after returning within abdomen Reflux vomiting occurred, 132 ounces of deeply bile stained fluid were vomited in two days I, therefore, reopened the abdomen and performed an enteroanastomosis between the afferent and efferent limits of the anastomosing loop The patient recovered The patient was sent to Dr R W S Bishop, Kirkby Malzeard She gained 9 lbs in weight She often remarked 'I'm surprised at myself eating so much' Report received from Dr Bishop, June 28, 1905 "I saw Miss B last night and send you following particulars of her present condition General condition excellent, far better than for several years before she had perforation, strong, able to walk with ease to and from Ripon—five miles, both ways ten miles—and even farther No anæmia, well nourished and in good spirits apparently in perfect health No gastric pain or discomfort, no nausea vomiting or flatulence—"body much smaller than before operation"—no attacks of distension as before Bowels more or less regular, and kept all right by aid of brown bread and similar rough food Able to eat everything This year has eaten more salads than for many years past Had one attack of indigestion in two years not of long duration, generally careful not to eat most indigestible foods

CASE IX—*Old Subacute Perforation, Adhesion to Pancreas* September 25, 1902 female aged 60 Has been failing in health for 9 to 10 months The chief symptom has been vomiting At the onset a sudden seizure of vomiting, very acute and lasting over 24 hours There has been a series of attacks of vomiting Pain is noticed about an hour before a meal is due, and lasts from a few minutes to two or three hours is never very severe She has lost flesh and has got weaker, occasionally having to spend a part of the day in bed No melæna No hæma-

temesis. A small, hard tumor felt above and to the right of the umbilicus, a little movable. On distension with CO<sub>2</sub>, an enormous stomach, reaching a full hand's breadth below the umbilicus. At the operation a very large stomach was found. On the posterior surface of the stomach one large ulcer with several thick adhesions around it. In the second portion of the duodenum the tumor was found. It was a mass about the size of a large walnut, adherent to the pancreas, with which it seems inseparably connected. The duodenum above this point looks distended. Probably chronic duodenal ulcer with interstitial pancreatitis. The patient recovered. The patient was sent by Dr. Welch, Staningley. In Jan., 1903, she was eating heartily, and was free from all discomforts. Report received from Dr. Welch, June 21, 1905: "I saw Mrs. B. to-day. She tells me that she has enjoyed excellent health since the operation, and has had no stomach trouble of any sort. She certainly looks very well, and she does all the housework at her own home."

CASE X.—*Old Subacute Perforation; Adhesion to Pancreas.* December 14, 1904; female, aged 50. Perforation of an ulcer occurred 9 months ago (probably). There was acute peritonitis of sudden onset, intense epigastric pain, collapse, vomiting, etc. For more than a month she was extremely ill. The general peritoneal involvement subsided, and epigastric fulness, tenderness and rigidity remained. Since then has had constant pain after food, often intense, vomiting, inability to take solid food, and marked wasting. At the operation, an ulcer about junction of middle and pyloric third, absolutely welded to the pancreas. Gastro-enterostomy on proximal side. The patient recovered. She was sent by Dr. Bertram Watson. Report received from Dr. Bertram Watson, June 21, 1905: "Mrs. T. is in good health. The operation completely relieved her stomach symptoms, which, you will remember, were of 14 months' duration. I do not know what increase of weight there has been, but she tells me that she can eat anything now with impunity."

CASE XI.—*Old Subacute Perforation; Adhesion to Abdominal Wall.* January 7, 1905; female, aged 45. In May, 1904, an acute attack of abdominal pain, and vomiting, followed by distension. It was thought that there might be a rotation of an ovarian cyst, but the acute illness subsided in a few days. Since May, 1904, has suffered much from pain after food, vomiting,

etc., and has lost weight Since her confinement, six months ago, has noticed a swelling at the lower part of the abdomen On examination now, a hard lump, just to the right of the middle line, adherent to abdominal wall In lower part of abdomen an ovarian cyst, equal in size to a six months' pregnancy At the operation, incision made between umbilicus and pubes, a large ovarian cyst springing from the right side Much glairy fluid in the peritoneum No twist of pedicle An examination of the stomach showed a hard mass at pylorus, which was adherent to abdominal wall Probably a 'subacute' perforation of a gastric ulcer *Posterior gastro enterostomy* The patient recovered She was sent by Dr Macaulay, Halifax She was reported well in 1906

### CLASS III SUBACUTE PERFORATION HOUR GLASS STOMACH

CASE XII—August, 1899, female aged 39 Ten years ago the patient had an illness characterized by profound anemia Seven months ago there were clear symptoms of ulcer of the stomach, but neither then nor at any time any acute illness suggestive of perforation Now vomits after all ordinary food and more often than not, even after small quantities of fluid food Pain after food was exceedingly severe On examination of abdomen a dilated stomach could be felt At one point, a little to the left of the middle line and slightly below the ensiform cartilage was an area 2 inches in diameter which was markedly tender, and offered increased resistance on palpation This area was found at the operation to correspond precisely with the area of stomach adhesion The patient had lost weight and deteriorated seriously in general health during the last few months At the operation an hour-glass stomach was found The narrow constriction was near the middle of the stomach, and adherent to the anterior abdominal wall over an area equal to a crown piece On each side of this the stomach dilated and seemed to be anchored by the adhesion On separating the stomach from the abdominal wall an opening into the viscus was exposed and the stomach contents escaped The opening was enlarged transversely and the wound and fistula were stitched up vertically An omental graft was brought to cover in the sutured area in order to guard against future anchoring The



patient recovered. For a month after the operation there was pain at times and loss of appetite. Since then she has been free from pain and in excellent health. Appetite and digestion are good. The patient was seen with Dr. Bailey, Horsforth. In Feb., 1902, her condition was still perfectly satisfactory. In Oct., 1903, the patient was reported to be in perfectly good health—"in excellent condition." In July, 1905, in sound health. "A complete cure."

CASE XIII.—April 6, 1901; male, aged 46. Symptoms for 12 months; pain, heaviness, discomfort after meals; loss of weight and general deterioration in health. At Christmas had a sudden attack of acute pain and hæmatemesis, and was very ill for several days; since then has never taken any food (solid or liquid) without pain. Has noticed on several occasions that the stools were "black as ink." Vomits now every day. At the operation 2 ulcers were found near the pylorus, one on gastric, one on duodenal side. A mass equal in size to a walnut was found at the pylorus. Pylorus was very narrow, adherent to liver, and gall-bladder by dense bands. At the middle of a hugely dilated stomach was a constriction that would admit 4 fingers. Posterior gastro-enterostomy to pyloric pouch. At the necropsy 2 ulcers (duodenal and gastric) were found, the former very adherent to the gall-bladder; the latter had perforated into a mass of adhesions, its base being partly formed by the pancreas. The patient died. The patient was sent by Dr. Crawford Watson, Harrogate. All went well for 3 days; then a large prolapse of rectum (from which he had previously suffered) came down during the night, and was not discovered for 4 hours. When I saw him the prolapse was livid and œdematous, and could not be reduced until ether had been administered. From this time patient became gradually worse; the temperature ran up to 104 and 105, and he died 4 days later. The following is an abstract from the necropsy record, written by Dr. Maxwell Telling: "The stitches are quite sound, the opening good, and surgical technique perfect. No peritonitis. The hæmorrhoidal, and inferior mesenteric veins are full of disintegrating clot (septicæmia)."

CASE XIV.—January 14, 1904; female, aged 35. First attack October, 1901; acute sudden pain, faintness and collapse. In bed for a fortnight then; the chief physical signs being exquisite local tenderness and fulness in the epigastrium. Ever

since has had pain about one hour after food, relieved by vomiting. No hæmatemesis. She recovered April, 1902, and then kept well up to December, 1903. She then had pain and flatulent distension about an hour after meals, with regurgitation of highly acid fluid. On January 13, 1904, about one and a half hours after a light meal and while sleeping in a chair, she was seized with sudden violent pain and became collapsed. I saw her about 1.30 P.M., January 14,—*i.e.*, about 18 hours after the onset of acute symptoms. On opening the abdomen the stomach was found to be adherent by recent lymph to the under surface of the liver. On separating the adhesion, a small perforation was found. It was closed by two layers of Lembert's sutures. It was now noticed that the puckering of the chronic ulcer had caused a narrowing of the stomach at about its middle. Gastropasty was performed. The patient recovered. In March, 1905, was in perfect health, had gained weight and was eating well. Seen with Dr. Baskett, Halton.

CASE XV—February 8, 1904, female, aged 42. Sudden onset December, 1900, while lifting a heavy weight. She had had pain and vomiting almost every day since. In July, 1901, a tumor was noticed in the abdomen, this tumor has not increased in size. She has once vomited bright blood. She is fearfully emaciated, her weight has gone down from 8 st 9 lbs to 5 st 7 lbs. There is a painful tumor to the left of the umbilicus. The veins of the anterior abdominal wall are much distended. Incision made over tumor. This was found to be a large inflammatory swelling formed by the base of a large ulcer of the stomach adherent to the anterior abdominal wall. The ulcer was at the junction of two pouches. The ulcer was cut away and the stomach closed. The condition of the patient was so bad as not to allow time for a gastro-enterostomy. The patient recovered. Her doctor reports early in 1905 "Gained 2 st, eats anything and does her own housework." In July, 1905 symptoms were beginning again and it seemed not unlikely that gastro-enterostomy will be necessary. In August 1905 gastro-enterostomy was performed, the patient recovered, and is now (March, 1906) in good health.

# REPORT OF A CASE IN WHICH A LARGE NUMBER OF FOREIGN BODIES WERE REMOVED FROM THE STOMACH.\*

BY ARTHUR E. BENJAMIN, M.D.,

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THE literature is quite full of cases operated upon for the removal of foreign bodies from the stomach, but as a rule these individuals seek the advice of a surgeon only when the suffering becomes intolerable. A great many foreign substances have been removed at post-mortem from the stomach.

When the stomach is not dilated or ulcerated, and when the pylorus is patulous, gastrotomy is sufficient, with the removal of the foreign bodies. A gastro-enterostomy is occasionally demanded on account of the obstruction at the pylorus. The case I have to report is as follows:

Mr. E. W., aged 47, American, 4 feet 11 inches tall, weighs 140 pounds. His occupation is that of glass and nail eater. Has eaten glass for 20 years and it never troubled him until February, 1906. Has swallowed 8- and 10-penny nails and horseshoe nails for the last five years; a few were passed in stools. Has swallowed pieces of glass as large as his thumb. Mouth has been cut several times, anus cut once. Stools have been black only during the last five or eight months. Drinks a gallon of water at a time in one minute. Has drunk 40 gallons of water in a day. Four years ago had a hæmorrhage from stomach after drinking 12 gallons; bled about one pint. Is a contortionist, eats fire and is a strong man. His last attack came on while in St. Louis, five weeks ago. He was on the street when he was taken suddenly with severe pain across stomach and in region of heart. Was taken to hospital in St. Louis and remained there three weeks until he came here, two weeks ago. Was fairly

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\* Read before a joint meeting of the Crow River Valley and Meeker Co. Medical Societies, at Litchfield, Minn., Oct. 10, 1906.

well until two days ago when he was taken again and laid up in bed for a couple of days.

Patient vomits considerable matter of a black color, which tastes like iron rust. Stools are of a black color. Has a feeling of weight in his stomach. Has lost about 25 pounds in weight in the last five months. Has not lost strength at all, but is short-winded. It hurts him to breathe, especially to do deep breathing, which produces the sensation of a knife cutting in his stomach. There is a constant steady pain which becomes worse at times. Says that he can feel objects in his stomach at times.

*Habits*—Uses tobacco moderately, has been an inveterate drinker until eight months ago, since which time he has drunk no alcoholics. Appetite and sleep good. Bowels are constipated. Patient is well nourished, muscular, bends with his teeth an iron rod  $\frac{3}{4}$  inches in diameter. Straightens out horseshoes, breaks rocks with his fist. Tongue not coated or scarred, of good size. Upper lip shows scar to right of median line. Eyes normal. Two fingers are gone from left hand.

*Family History*—Father died at 65 years of stone in bladder. Mother died at 75 of cancer of stomach. Two brothers well, two dead,—one of blood poisoning at 49 years, one of consumption and Bright's disease at 39 years.

*Previous and Present History*—Married. Has had 8 children, of whom 2 were still born and 4 died in infancy. Two are living and well. Patient was kicked in head by horse 22 years ago, receiving only scalp wound. Was in hospital 5 years ago and had first 2 fingers of left hand amputated. Was also in hospital three months ago for stomach trouble. At that time stomach was washed out but no foreign matter obtained.

*Condition on Admission*—Teeth in good condition—very short. Mouth and pharynx negative. Cannot take a deep breath. Stomach dilated two fingerbreadths below umbilicus—very tender. Temperature between  $97.5^{\circ}$  and  $99.5^{\circ}$ , pulse between 98 and 100. Chief symptoms. Pain, vomiting, black stools, loss of weight, feeling of foreign body in stomach.

Urine Normal except a few pus cells. Blood June 11, 1906, 3 P M, hæm, 90 per cent, R B C, 4,600,000, W B C, 10,200.

*Operation*, June 13 1906. General condition of patient Good before operation. Ether. Pulse before operation 90,

pulse after, 100. Operation commenced 9.05 A.M., completed at 10.30 A.M.

*Description of Operation.*—Vertical median incision—stomach greatly dilated. Induration found at pyloric end. The stomach wall was greatly thickened in places, in others showing scars of healed ulcers. The wall was generally very friable and with difficulty held the sutures. Posterior gastro-enterostomy. Two rows of Pagenstecher thread and one row of catgut; Lembert sutures. Irrigation of stomach. Dry dressings, cigarette at top of incision. Fifty-two nails were removed through the opening made. (Fig. 1.) Some of them were as small as shingle nails, but most of them 6- 8- 10- and 20-penny nails removed from sacculated cardiac end of stomach. These were in various stages of erosion, two being like darning needles. Also 5 pieces of thin glass removed.

The nails were in bunches and a number of them imbedded in the stomach wall and surrounded with exudate, making their removal more difficult and accompanied by some hæmorrhage. The extra suture row was used to prevent a leak, owing to the possibility of some of the sutures cutting through the friable wall.

This case was of especial interest because of the particularly bad condition of the stomach, viz.: the ulcerated areas; the thickened walls which were hypertrophied and fibrous in places where old ulcers had healed; because of the friability of the stomach wall along the greater curvature, and, especially, because of the obstruction of the pylorus and the large size of the organ.

This patient did not vomit after the operation. He made a rapid convalescence, and on the fifth day insisted on eating solid food. On the seventh day he was out of bed, as he declared himself well. On the ninth day he could not be persuaded to stay in the hospital longer and went home. The following day he was around town looking for a job, and on the twelfth day he called at my office demanding the nails, as he stated he had a chance to make \$5.00 that evening by exhibiting the same, and was only persuaded to leave without them by the loan of a dollar, to pay board, as he said. He stated since leaving the hospital he was eating regular food and felt



FIG 1 —Foreign bodies removed from stomach



well Four days later, while in a neighboring city, he was seized with severe pains in the stomach He was taken to a hospital and kept quiet for a few days when he was out again

He has since called at my office stating that he had suffered occasionally but was comparatively well



# SARCOMA OF THE SMALL INTESTINE AND MESENTERY.

REPORT OF A CASE IN WHICH SIX FEET AND FIVE INCHES OF THE SMALL  
INTESTINE WERE REMOVED, WITH RECOVERY.

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ON May 22, 1906, I was asked by Dr. Joseph to see with him at the Nuneaton Hospital, a boy aged six years, who was admitted on May 19 with abdominal pain and sickness, associated with a temperature of about  $100^{\circ}$ . Six weeks previous to the child's admission he had also suffered a similar attack with diarrhœa, and a month before admission the abdomen was noticed to be enlarged.

As soon as the child was admitted to the hospital the symptoms subsided, until May 22, when he again began to vomit after the administration of an aperient, but the bowels acted with the assistance of an enema given some hours after the administration of liquorice powder. When I saw the child he looked ill, his temperature was about  $100^{\circ}$  and his pulse also, he had a tumor larger than one's two fists occupying the central parts of the pelvis and the lower abdomen, reaching well above the umbilicus; it was movable laterally and vertically, was firm in consistence and free from tenderness. The position of the swelling, its mobility and the history of the pain, sickness, and, on one occasion, diarrhœa, suggested to me that the tumor was one of the great omentum dragging upon the colon, and the mobility was so free that I determined to attempt the removal of the growth.

The abdomen was opened slightly to the left of the middle line, when it was found that the surface of the growth was covered by, and seemed to be intimately blended with, the great omentum, the very large vessels of which ramified over the sur-



P G Sa om o sn a tes e

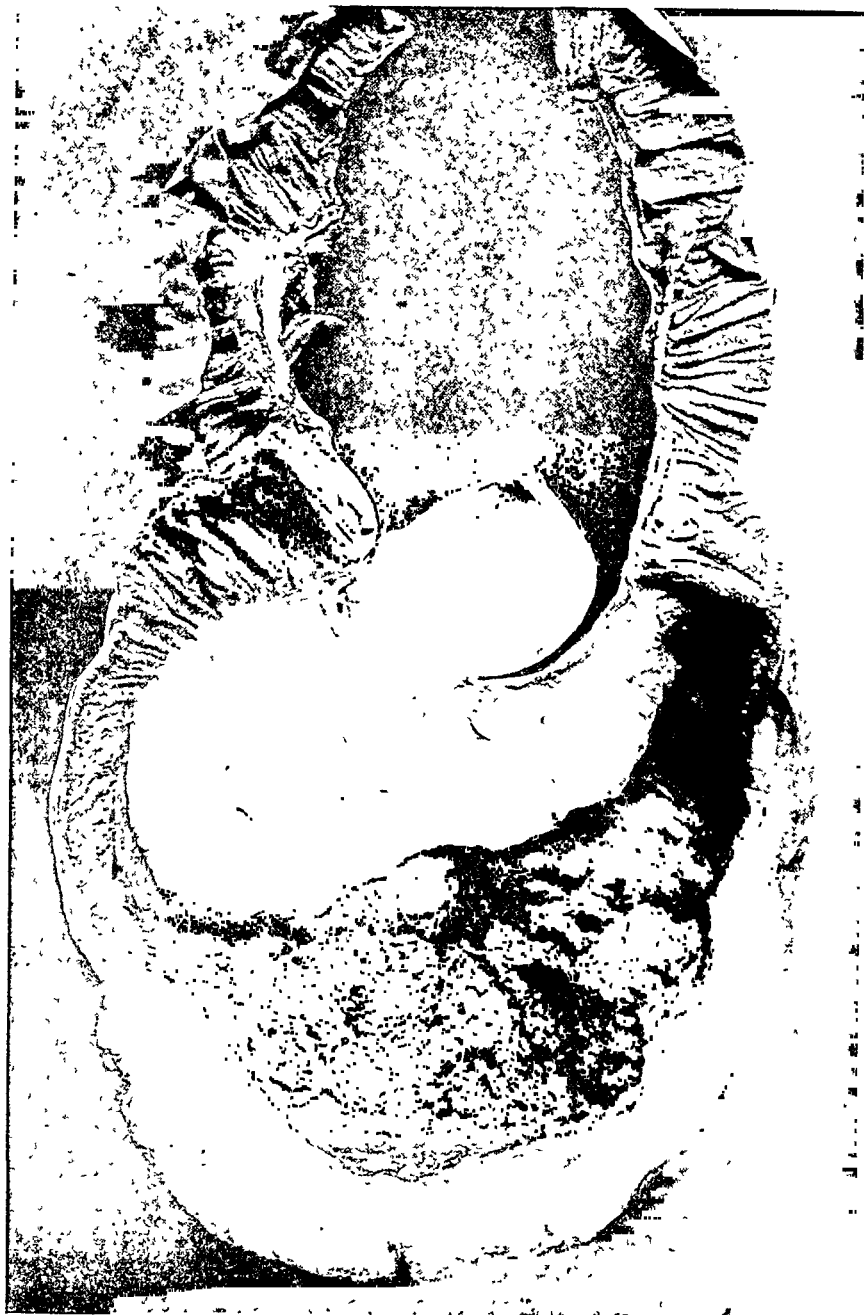


FIG. 2.—Section through the growth and intestine.

face of the tumor, the hand passed into the pelvis detected a wide band of adhesion at the posterior surface of the bladder. The great omentum was ligatured off and the bladder adhesion also, the hand passed under the tumor and it was lifted out of the abdomen. It was then discovered that a coil of small intestine ran right through the middle of the growth as is well shown in the accompanying Fig 1. Following the tumor upwards it was found that it encroached very much on the mesentery of the small intestine and that to remove it and yet leave a sufficient blood supply to that portion of the small intestine which remained behind a very extensive resection of intestine would be required. The blood supply to the small bowel was double ligatured piece by piece by the aid of an aneurysm needle thrust through the mesentery the ligatures extending from close to the ileo cæcal valve upwards until it was evident that the place was reached which was above the growth and yet left the small bowel well vascularized. The mesentery was now divided between the double ligatures and the bowel also at the extremities above and below the growth scarcely any blood was lost and only one or two fine points needed further ligatures. The upper end of the lower piece of small intestine which was quite close to the ileo cæcal valve was inverted and closed by sutures the lower end of the upper portion of the small intestine was approximated to the lateral wall of the ascending colon by means of a Murphy button and the abdomen was closed.

A comparatively uneventful recovery followed the pulse record was at its highest 128 on the first night and remained above 100 for ten days while the temperature which at the end of 48 hours was 101 gradually fell to normal the button was passed on the twelfth day. While the boy remained in bed he had two sometimes three rather loose motions every day he has been kept under observation since he left the hospital and his weight has been taken on several occasions. On June 14 he weighed 30 lbs and on July 8 the weight had steadily gone up to 36 lbs while at the present time he is just 3 stone he appears well in all ways but his motions remain too frequent and often very offensive.

Examination of the removed parts shows that the tumor is a round celled sarcoma the origin of which may have been either in the wall of the small intestine or in the mesentery close to it,

case of lumbar hernia," and that a similar statement could be made concerning the superior lumbar triangle. These statements were made after studying the analysis of 29 cases which Braun had made in 1879, and the 51 cases which Grange<sup>5</sup> and Besendonk had made at a later time.

Baracz in an exhaustive article on the subject in Langenbeck's Archives in 1902 (Bd. lxxviii, s. 631-677), states that lumbar hernias are uncommon and not sufficiently understood and that only three cases are known where the place of exit was verified by autopsy. He reported and collected enough cases to bring the total number to 68, including the congenital, traumatic, and spontaneous varieties and those following cold abscess. In order to determine the most probable place of exit of these hernias he dissected the lumbar regions of 38 cadavers and published drawings of each case. He thinks that the triangle of Petit is not likely to be the site of the hernia but rather the superior triangle or rhombus already referred to. He named this the "*spatium tendineum lumbale*." It was present in 95 per cent. of his dissections. He called attention to the defect in the aponeurosis of the internal oblique muscle here and to the passage of the subcostal nerve and the accompanying artery and vein. He considers the next weakest spot in the lumbar region to be in the tendinous part of the *latissimus dorsi* where the *ramus lumbalis* and the ileo-lumbar vessels go through.

There has been one case of lumbar hernia shown before the New York Surgical Society, by Dr. Coley, in 1901, and he referred to another which had been successfully operated upon in the Hospital for the Ruptured and Crippled.

The condition is manifestly not common and the writer therefore presents this patient and the accompanying photograph and drawings which depict the hernia and the operation for its cure.

The child, who is three and a half years old, was brought to him when three months old by Dr. Eversfield, for a protrusion in the lumbar region. This was about the size of a goose-egg,

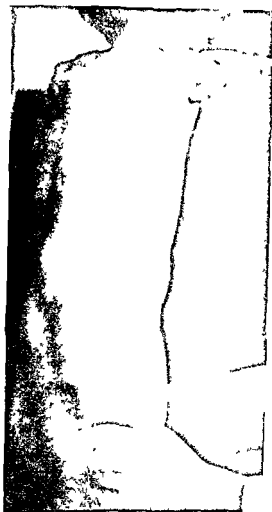


FIG. 1.—Congenital lumbar hernia presenting through an enlarged triangle of Petit

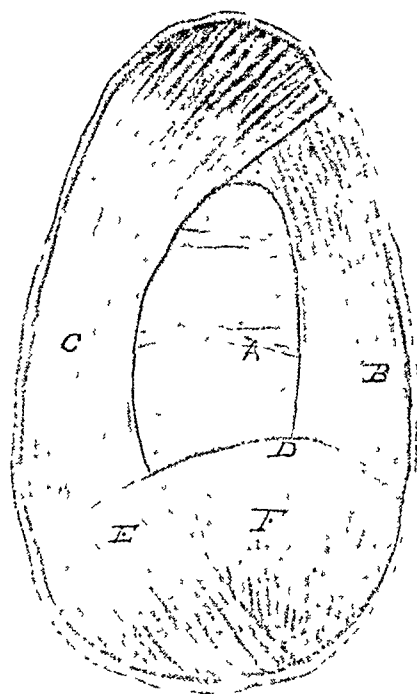


FIG. 2.—Congenital lumbar hernia *A*, Transversalis fascia *B*, External oblique muscle *C*, Latissimus dorsi muscle *D*, Crest of ilium. *E*, Gluteus maximus muscle *F*, Gluteus medius muscle

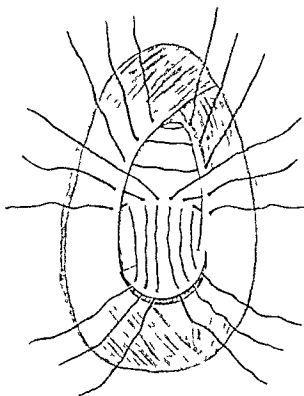


FIG. 3.—Operation for the cure of congenital lumbar hernia. Flap composed of fascia lata and aponeurotic part of gluteus maximus and medius. Stitches placed for suturing the flap to the lumbar fascia, to the external oblique muscle and to the latissimus dorsi muscle and for drawing the upper parts of the latissimus dorsi and external oblique together.



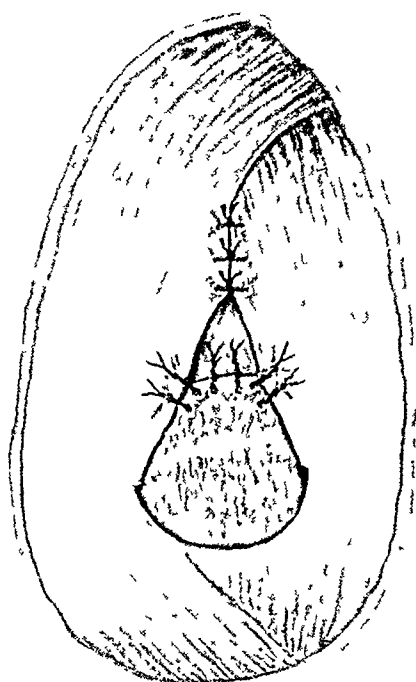


FIG 4 —Stitches tied, leaving a triangular defect above the flap

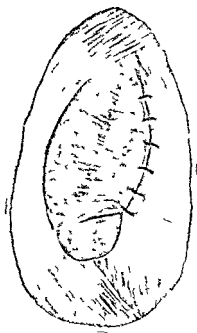


FIG. 5.—Trapezoid defect: tired area covered by a flap from the aponeurosis of the latissimus dorsi muscle.



and the margins of the hernial openings could be distinctly felt and corresponded to Petit's triangle. An elastic belt was applied and held the protrusion well in position for more than two years but as the child grew the hernia also increased in size, and the accompanying weakness was a menace to the child and consequently a source of much anxiety to the parents. Its appearance is shown in Fig. 2. The opening was larger than the palm of one's hand and bulged in a marked way on coughing or upon exertion. There were two transverse constrictions across it, and in the lower part there was a distinct soft nodule.

On incision the hernia was seen to come through the triangle of Petit, which was greatly enlarged. The transverse bands were thickened portions of the lumbar fascia. The sac of the hernia was distinct, but there was no narrow neck. The nodule at the lower end was the appendix vermiformis. This was removed; a portion of the sac was excised, and the tissues were then brought together from the sides, the margins of the external oblique and the latissimus dorsi being drawn together as far as possible. After this was done, there was, however, a triangular defect above the crest of the ilium. An effort was made to close this in with an aponeurotic flap turned up from below. The fascia lata and the aponeurotic tissue about the insertion of the gluteus maximus and medius formed a fibrous layer which could be used as a flap, and which was turned up having the attachment at the crest of the ilium as a hinge. This was stitched in place with chromic gut. Some sutures passing through the previously mentioned transverse band some through the edge of the latissimus dorsi and others through the edge of the external oblique muscle. There was, however, still a triangular defect above the flap, and this, together with the repaired area was covered by turning forward a flap cut from the aponeurosis of the latissimus dorsi. This was stitched to the external oblique.

The closure of the defect was satisfactory, but the operation had the prime defect of leaving a large amount of ill nourished tissue in the wound, and much chromicized gut which was used for stitching. The greatest possible strain was put upon this tissue, since the child promptly developed pneumonia, and at a later time German measles and there was a suppuration of the wound. In spite of these complications, however, the result is good and the lumbar wall is firm, eight months having elapsed

since the operation. He walks and holds his body well, and does not seem to suffer from the injury which has been done to the aponeurotic structures of the region.

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# TUBERCULOSIS OF THE BLADDER.

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IN the preparation of the following article I have studied 413 cases of tuberculosis of the bladder which I have collected from the literature, and 34 others from Dr Halsted's wards in the Johns Hopkins Hospital and my private practice. I have examined the preserved tissues from cases of bladder tuberculosis, and have gone over all of the records pertaining thereto in the Johns Hopkins Pathological Laboratory. By the kindness of Dr Cullen I have been permitted to study additional material from Dr Kelly's gynæcological service. I have also obtained specimens of this disease which have been preserved in other institutions, and in order to observe more fully its beginning and course I have inoculated the genito urinary organs of guinea pigs and rabbits, and watched as far as possible the development of the morbid process.

The literature of this subject is very voluminous, and the conclusions as to the surgical treatment are various and contradictory, rendering it difficult to arrive at the truth. The general impressions, however, which I have obtained from this perusal in conjunction with my personal experience, have led me to the conclusions set forth in this paper.

## HISTORY

Prior to the fifteenth century there are no descriptions of disease of the bladder sufficiently clear to enable one to identify instances of vesical tuberculosis. And indeed, up to the writings of Ambrose Pare there are no records of this disease. After him there is no mention made of it until Bayle cited a number of cases of genito urinary tuberculosis, and concluded that the process might be limited to the bladder, or at least not extend beyond the genito urinary organs.

Lænnec in 1819, in his exhaustive clinical and pathological study of general tuberculosis, found in several subjects that the disease was localized in the genito-urinary organs, and in the description of these cases he gave a very precise autopsy picture of tuberculosis of the bladder. Following him, John Howship in 1823 and Larcher in 1827 described this malady in some detail, the latter being the first to note the presence of tubercles in the vesical mucous membrane.

Cruveilhier, in his characteristically thorough manner, studied several examples of this affection, and was of the opinion that next after the kidney the bladder most frequently became implicated. No notice was taken of this observation until recently when it has been proved to be correct.

Rayer in 1841 made very accurate and beautiful drawings of various tuberculous lesions of the bladder and kidneys; several of these remain unsurpassed in clearness.

After a thorough study of a large number of cases, Wilkes in 1859 concluded that the bladder was never the primary seat, disease of the kidney always preceding its implication. Gebhard, in his admirable thesis, concurred in this opinion. Guyon and Lancereaux a few years later, on the other hand, expressed the opinion that the bladder was in most instances primarily affected, and that the kidneys were implicated by ascension. The profession seems to have been influenced largely by these teachings and to have generally adopted this view. Gradually, however, these ideas lost ground, and it is now known that the bladder is almost never the primary seat of tuberculosis. Moreover, the work of Cayle, Baumgarten, and others has proved that the disease rarely ascends to the kidney.

#### FREQUENCY OF BLADDER TUBERCULOSIS.

In 2390 general autopsies in the Johns Hopkins Hospital Pathological Laboratory, tuberculosis of some organ was found 710 times; in this number one or more of the genito-urinary organs was involved 160 times; the bladder was affected 22 times, but in no case was the disease primary in this viscus. The kidneys were affected 131 times (in 111 with miliary and

in 20 with chronic tuberculosis), the prostate 17 times, the Fallopian tubes 16 times, the uterus 11 times, the epididymes or testes 9 times, the ureters 9 times, the urethra 4 times, the ovaries thrice, and the vagina twice

Saxtorph in 10,016 autopsies found 547 instances of tuberculosis of the genito-urinary organs. There were 342 instances of acute miliary processes in the kidney, but only 4 of miliary tubercles in the bladder. In 205 cases of chronic genito urinary tuberculosis, the bladder was involved *alone* only once, but in 52 cases there was a secondary implication of it—in 38 men (622 autopsies) and 14 women (3894 autopsies). In the 38 men the kidney was implicated 32 times, the prostate 29 times, and the seminal vesicles 20 times. In the 14 women, the kidney was tuberculous 13 times, and the genital organs 3 times.

Von Groenow in 82 deaths from general tuberculosis found 14 invasions of the genito urinary organs among which there were 10 bladder implications. Posner in 115 tuberculous kidneys recorded 12 infections of the bladder (autopsy report). Heiberg in 16 instances of primary genito urinary tuberculosis in the male observed implication of the bladder 11 times. In 13 cases of primary tuberculosis in the female, the bladder was implicated 8 times. In 32 instances of secondary infection of the genito-urinary tract in the male, the bladder was affected 9 times. In 22 in the female, 9 times. In the male series there was no instance of an isolated bladder tuberculosis, in the female there was 1. Matile, in 1726 autopsies for tuberculosis, found that the genito urinary tract had been invaded 123 times, among this number in 19 the bladder was tuberculous.

In 31 cases of genito urinary tuberculosis noted by Goldberg the bladder was implicated in 23. There were 35 bladder infections in 51 cases of renal tuberculosis studied by Gaultier Jullien, after a careful examination of 41 instances of tuberculosis of the prostate, records implication of the bladder in 13. Extension to the bladder was discovered by Desnos thirteen times in 16 cases of tuberculosis of the prostate. In 23 cases



in which Israel operated for tuberculosis of the kidney the bladder had become infected in 11. Among 23 patients suffering from genito-urinary tuberculosis whose cases were recorded by Krzywicki, there were 13 who had bladder lesions.

#### PATHOLOGY.

The latest and by far the most comprehensive work which has been done on the pathology of tuberculosis of the bladder is by Motz and Hallé. I have adopted in part their classification and have not hesitated to draw largely on their descriptions.

We shall divide, somewhat arbitrarily I admit, tuberculosis of the bladder into the four following stages:

- (1) The period of invasion and formation of tubercles.
- (2) The period of superficial ulceration.
- (3) The period of deeper infiltration.
- (4) The period of more widespread destruction.

It is impossible to strike the boundary lines between these periods, for in some bladders they are so merged one into the other that nothing definite can be made out in regard to the stage. The third, that of infiltration, is usually the last, for the fourth, the period of destruction, occurs only seldom.

(1) STAGE OF INVASION.—It is rare that one has the opportunity of observing the very beginning of tuberculosis of the bladder. I have chanced on it once in a case of infection coming from the prostate.

The tubercles (according to Hallé and Motz) are usually situated in the lower half around the orifices of the ureters or in the trigone; they vary in size, from the smallest ones which are scarcely visible, up to that of a mustard seed. At first they are gray, transparent or hyaline, sometimes resembling minute cysts; others do not show this transparency, but are opaque from the onset; as they become older they assume a yellowish tinge. Both the yellow and the gray tubercles project slightly from the surface, each being surrounded by a faint rosy zone which is made up of injected blood vessels. The epithelial layer over them in the earliest stage is intact,

but gradually loses its lustre, begins to exfoliate and later becomes necrotic. As the age of the tubercle advances there is a loss of substance at the apex and the formation of an extremely minute ulcer. This last picture is very seldom seen, for usually there is a coalescence of several tubercles before the ulcer is formed.

Following very closely the above described process, there can be made out a number of other tubercles springing up very close to the older ones, which in a short time merge with them, and form a conglomerate mass the size of a pea. This appears as an opaque projecting nodule which is covered with an intact lustreless and partly necrotic mucous membrane. This stage is the immediate predecessor of the ulcer.

Histologically, the tubercle appears to develop in the capillary zone just beneath the epithelium, and just above the derma. This situation was interpreted by Clado as meaning that the infection of the bladder was through the blood, and was not a direct contamination from the urine. Such a belief, however, is contrary to clinical observation and to many pathological facts. The development, therefore, of tubercles in this region, is probably explained by the entrance of the tubercle bacilli to the deeper layers through a small crack or fissure or by direct penetration.

The very first change which the presence of tubercle bacilli brings about is a slight dilatation of the minute blood vessels, immediately following this there is a proliferation of the connective tissue which gives rise to the formation of lymphoid cells, these at first are scattered but they soon become more or less aggregated, and in the centre of such cell masses the epithelioid type appears. As the stage advances, by the use of careful staining methods, a change can be made out in both the epithelioid and lymphoid cell, the former presents a more granular protoplasm with a less vesicular nucleus, whereas the nucleus of the latter is much more deeply stained. Just at this time one or more typical giant cells are visible, and an invasion of leukocytes occurs. The cells in the centre soon begin to show more and more signs of degeneration.

until, finally, actual necrosis takes place and a microscopic cheesy mass is formed. The overlying mucous membrane at this time presents definite alterations, the blood vessels are slightly engorged, the epithelial cells have a granular protoplasm and a less clearly defined nucleus, and soon begin to exfoliate. The endothelium of the blood vessels immediately surrounding the tubercle proliferates, causing a thickening of the wall and occasionally occlusion of the lumen. The bacilli at first are more or less evenly distributed throughout the cell aggregation, but later they tend to disappear from the centre and are seen only in the periphery.

(2) STAGE OF ULCERATION.—Occasionally one observes a necrosis of a single microscopic tubercle with the formation of an extremely minute ulcer; as a rule, however, several tubercles coalesce, necrose and slough, thus forming a much larger ulcerated area. The latter is usually the type which is first discovered and which marks the beginning of the stage of ulceration. The ulcer spreads itself irregularly in the surrounding mucous membrane, partly by the springing up and secondary necrosis of tubercles in its border, and partly by the erosion of the walls due to the tuberculous toxins.

As seen in this stage, then, the ulcerated area will measure from 2 to 5 mm. in its widest part; it is very irregular in shape, with small arms, which project into the surrounding tissue, and edges that are ragged, worm-eaten, and overhanging, or in other words, undermined; the base is covered by a very delicate anæmic granulation tissue, over which is irregularly spread a fibrinous exudate. The tissue immediately surrounding the edges is somewhat swollen, slightly indurated, and irregularly reddened. Lying in this red zone or outside of it, one can usually discover gray and yellow tubercles, which are irregularly scattered, or may form a definite ring. Two or three ulcers with their adjacent tubercles can generally be found in the same bladder; these may merge into each other, or an intact strip of mucous membrane may be left between them. Occasionally they are single, as reported by Broca, Clado, Coplin, Kümmel, Strauss, Battle, Fenwick and Burckhardt.

The ulcer, as a rule, involves the submucosa, but does not usually penetrate to the muscle, more rarely it completely erodes the submucosa and exposes the muscle, forming what is called a trabeculated ulcer, in still rarer instances it penetrates the entire muscular coat

On histological examination, one sees that the surface of such an ulcer is covered by a thin layer of necrotic fibrin, immediately below which is tissue made up of small round cells, leukocytes, epithelioid cells, fibrinous masses and dilated blood vessels, together with scattered cell aggregations showing a tubercular arrangement. The walls of the blood vessels show varying degrees of endothelial proliferation. In the lower layers of the ulcer, as the muscle is approached, there is an extensive round celled infiltration but no tubercles. Throughout this granulation tissue tubercle bacilli are present, they are arranged in clumps, irregularly scattered among the cells with a tendency to aggregation in and around the tubercles.

*Trabeculated Ulcer*—The active ulcer after eroding the submucous tissues lays bare the fibres of the muscle which in turn form its base, these being covered by only a thin layer of granulation tissue give rise to the formation of an uneven trabeculated surface. The edges of such an ulcer do not differ from those of the type first described except that they are thicker, more ragged, and slightly more overhanging.

This type of ulceration occasionally continues to erode the muscle, and as a result ragged muscle fibres are seen projecting from the base.

Histologically the granulation base is formed of lymphoid cells, polymorphonuclear leukocytes dilated blood vessels with an occasional attempt at the formation of cell aggregations resembling tubercles but not usually developing into one definitely visible. The muscle itself is infiltrated with small round cells, this invasion is usually limited to the muscle immediately surrounding the base of the ulcer, but sometimes is much more extensive.

*Granulation or Vegetating Ulcer*—Projecting from the

sides and base of this type of ulcer are vegetations in the form of a dark velvety fringe or definite papillomatous masses. The larger of these projections are irregular in shape and occasionally are pedunculated as a result of the erosion which has occurred on their sides. The base of such an ulcer shows only a small amount of necrotic fibrin, and the edges are not so much undermined as is usual in other forms. This variety is infrequent, and when found has resulted from a very chronic kind of tuberculosis which is neither virulent nor progressive.

Histologically these vegetations present the cellular arrangement of ordinary non-tuberculous granulation tissue; some of the larger ones contain epithelioid and giant cells, an indication that they have been invaded by tuberculosis. The tubercle bacilli are not present in those which are made up only of granulation tissue.

Another and still rarer type is seen when the muscle has become eroded; here the projecting masses contain bits of muscle as well as granulation tissue.

*The muscle* in the stage of ulceration is always hypertrophied from the overwork caused by frequent micturition.

(3) STAGE OF INFILTRATION.—As the ulceration increases and penetrates nearly to, or into, the already thickened muscle, the tuberculous process, either directly or by its toxins, sets up in it an inflammatory reaction which is evidenced by the widespread infiltration with lymphoid cells and leukocytes, which in turn give rise to a subsequent development of fibrous tissue. Some specimens show only such an inflammatory change; in others there is a general dissemination of the tubercle bacilli, with a consequent formation of tubercles scattered throughout the tissue. The muscle which was hypertrophied before, now becomes much more thickened by this infiltration, more irritable, and consequently more responsive to stimulation; as a result there ensues an exaggeration in the frequency of micturition. As this stage progresses, there is a degeneration of the muscle, and a replacement of it by connective tissue, which gradually interferes with its contractile power, so that the bladder becomes unable to empty itself.

The ulceration in this stage of infiltration advances and finally becomes so extensive that there is almost complete erosion of the whole mucous membrane. In one case that I have observed, the mucosa was so nearly destroyed that there remained only small fragments here and there. Fenwick observed a bladder in the infiltration stage in which all the mucous membrane was exfoliated except the trigone. Kidd, in a similar bladder, found the inside lining a mass of granulation tissue except over a small portion of the right lateral wall. Krzywicki records an example in which entire destruction of the whole mucous membrane and extensive invasion of the muscle were noted. In an exceptional instance reported by Haeffner, half of the bladder mucous membrane was necrotic, although the muscle was not infiltrated nor the bladder contracted. In a specimen shown to me in the Baltimore City Hospital by Dr. Rohrer there were only a few islands of mucous membrane left and the muscle was nearly everywhere exposed and extensively thickened by infiltration and hypertrophy.

The wall of a bladder in the stage of infiltration is always thickened, sometimes enormously so and the whole organ is very much reduced in size so that its capacity ranges from 100 cc. to 20 cc. Immediately surrounding the outside of the bladder there is formed a somewhat thick layer of inflammatory tissue.

The histological structure of the ulcerating surface and of the muscle in the above condition has already been described.

*Caseous Massive Infiltration*—This is a rare variety of the stage of infiltration. For its production two factors are necessary. First, very virulent micro-organisms, and secondly a very feeble resistance on the part of the tissues. In this form there is a very diffuse spreading out of the tuberculous process on the surface of the bladder and a rapid invasion of the muscular coat with widespread caseous degeneration. The mucous lining of the bladder is covered with grayish yellow caseous masses which project and render the surface uneven, hanging here and there from these masses and the mucosa are

detached flakes of necrotic fibrin. There are few or no ulcerations. The muscle wall has been changed over a considerable extent into cheesy material, and what remains has undergone a partial disintegration. This wholesale destruction of the muscle has deprived the bladder of its tone and its power to contract, so that it is usually found distended; exceptionally it appears half contracted with rigid walls. The connective tissue outside of the muscle is rarely invaded.

Histologically there are large masses of grayish-yellow, entirely structureless material; around these areas in the still vital tissue are numerous rapidly necrosing tubercles. The muscle which remains is filled with small round cells, the individual fibres are slightly shrunken, the protoplasm of the muscle cells is granular, and the nuclei show a beginning fragmentation. Here and there one can see the outlines of single fibres surrounded by degenerated tissue, giving one the impression that the connective-tissue framework of the muscle has remained while the actual cell has vanished. Tubercle bacilli are present in enormous numbers, and frequently other organisms, particularly streptococci, have aided the work of destruction.

*Diphtheroid Form.*— This is a variety which is difficult to classify, but more nearly conforms to the infiltrative type than to the other processes. In this there are virulent tubercle bacilli, to which are added streptococci, or a very active form of the colon bacillus. The picture is that of an acute process, and shows an extremely rapid and extensive invasion of the mucous membrane and the muscle, which gives rise to the formation of an enormous yellowish-gray fibrinous exudate. Such a bladder has no unchanged mucous membrane; in fact, it is entirely covered by this dirty gray material, which forms a thick fluffy coat of various hues due to the different stages of necrosis. This fibrinous exudate is very intimately connected with the underlying mucous membrane and when separated from it leaves a bleeding surface. There are no ulcerations. Dittel and several others have reported such a condition of the bladder.

*Histologically* there is a very extensive inflammatory

reaction, as shown by a general lymphoid and leukocytic infiltration, an enormous production of fresh tubercles and extensive localized areas of necrosis, but an almost complete absence of large masses of cheesy degeneration as seen in the massive type. The picture, therefore, resembles more closely that of a streptococcus inflammation, to which has been added the formation of the multiple tubercles. The exudate is made up of coagulated and necrotic fibrin and resembles somewhat that seen in diphtheria.

(4) **STAGE OF DESTRUCTION**—In this stage the muscular coat has been more or less completely destroyed by a rather slow chronic type of tuberculosis and has been eroded its place being taken by a granulating membrane. The bladder has lost its contractile power and has been converted into a distended flaccid bag. Throughout this newly formed tissue the tuberculous processes may or may not be present there are usually no active lesions and occasionally the tuberculosis has entirely disappeared. Motz and Halle have observed and very carefully described several such instances.

Heiler found at autopsy so complete a destruction of the bladder that it was difficult to find any remnants of it. In its place was a small granulating sac, with a fistula into the vagina, through which the urine continually dribbled.

*Varieties*—Casper speaks of instances in which tubercle bacilli sometimes spread over the mucous membrane very quickly and produce a picture of an acute process not unlike a true cystitis. He terms the process a tuberculous cystitis in contradistinction to a tuberculosis of the bladder. Such a differentiation is not needed and tends to confuse rather than to elucidate. A cystitis of this kind is rarely, if ever, the product of tubercle bacilli but is usually due to the invasion of pyogenic organisms.

Bryson has made the unique observation of what he calls a localized parenchymatous tuberculous cystitis. He observed in a male on the anterior wall of the bladder a spiral-shaped spot the size of a silver dollar, which presented over its surface dark spots but an intact epithelium, the remaining mucous



membrane appeared normal. At first he did not understand its nature, but later, after finding tubercle bacilli, he decided that it was a rare type of a tuberculous lesion.

Stoeckel reports a very interesting condition which showed a number of polypoid excrescences; these appeared as raised pale areas, most of which were transparent; others were simple oedematous spots; and a few were grayish red. The trigone was normal except that it was very strongly injected; the bladder mucous membrane, was entirely free from tubercles and ulcerations; no tubercle bacilli were to be found in the urine; but an inoculation of a guinea-pig was positive, thus proving that the process was tuberculous. I have seen a similar picture in a male, which was undoubtedly not tuberculous, but was due to the effects of an irritating substance in the urine. It seems to me, therefore, that Stoeckel's case might have been an instance of tuberculosis of the kidney, the bladder lesions being caused simply by irritating toxins. In another case, Stoeckel found definite tuberculosis of the bladder, which from time to time almost entirely disappeared, and then returned.

Mirabeau records the case of a female in whom he observed, some time before death, an ulcer in the bladder, but at the time of observation he was not able to discover any other tuberculous lesion. This ulcer was watched by cystoscopic examination and observed to heal; moreover, there was a complete subsidence of the symptoms for one year; although in the bladder, during this time, different spots of inflammation could be made out. One and a half years, presumably, according to his report, after the healing of the ulcer, the patient developed tuberculosis of the lungs and died. A second patient had several attacks of what appeared to be, from cystoscopic examination, inflammation of the bladder, but was proved to be tuberculous by the finding of tubercle bacilli in the urine; in the interval the symptoms became quiescent and the lesions in the bladder cleared up. Such an observation tends to confirm the idea of Casper. In a third instance, along with active ulcers, were found old scars which Mirabeau took to be healed foci.

*Pericystitis*—In the later stages the bacilli themselves, or their toxins, probably the latter, get into the tissues immediately outside of the bladder and set up an adhesive inflammatory reaction, this produces a matting together of the bladder with the rectum, small intestines, etc. Englisch has observed and very carefully described this condition. This process does not usually show definite tubercles except in the last stage.

*Mixed Infections*—I cannot state with any degree of exactness the percentage of the cases in which a secondary infection occurred, for the reason that in the majority of the reports no mention was made of the presence or absence of other organisms. In those which I have personally examined, pyogenic bacteria were absent from bladders which had not been catheterized, and present in those in which the catheter had been used. I do not mean that all infections are brought about in this manner, for there are innumerable instances in which a secondary invasion has been present without any instrumental interference. The pathological picture presented in a mixed infection differs slightly with the type of the organisms, but the picture is usually that of a tuberculous process with the addition of an ordinary inflammation. Some pyogenic organisms stimulate the activity of the tubercle bacilli, others have no effect upon them and a few are believed to even retard their growth. The organisms which have been found are colon bacilli, streptococci, staphylococci, gonococci and the proteus group. Streptococci and staphylococci, particularly the former, tend to increase the activity of the tubercle bacilli, colon bacilli do not aid their growth but produce a definite cystitis and in this way aggravate the symptoms, the proteus group sets up an ammoniacal fermentation which very greatly increases the pain and burning in urination but possibly lessens the activity of the tubercle bacilli. Gonococci have occasionally been found, Crismore, Schuchardt, Casper, Motz and others, have reported such contaminations. As a rule the gonococci are present in the early stages and disappear in the later, they produce a gonorrhoeal cystitis which renders the

bladder more susceptible to tuberculosis and sometimes seems to determine the starting point of this disease in the bladder.

*Location of Lesions.*—In bladder tuberculosis, secondary to the kidney implication, the first evidence is seen around the orifice of the ureter; this extends either backward or upward, involving the posterior part of the trigone and the mucosa behind it. When the disease comes from the prostate, it implicates the trigone, the neck of the bladder and surrounding tissues. There are several instances to prove that a tuberculous kidney may give rise to infection only of the mucosa around the orifice of the ureter, then skip entirely the base of the bladder and infect the prostate. I have seen such a case, and Bandler and others have recorded similar observations.

In 83 cases of my series the lesions were localized as follows: In the trigone or near it, 27 times; in the orifice of the ureters or adjacent to their margins, 23 times; in the base of the bladder, by which is meant the region behind the trigone, 10 times; in the posterior wall, 7 times; in the anterior wall, 7 times; in the vesical neck, 7 times; in the superior portion of the bladder, twice.

Le Fur out of 60 cases in 12 found the lesions in the region of the ureteral openings; in 10 in the base; in 9 on the posterior wall; in 5 on the anterior wall; in 5 on the trigone; in 3 on the neck; in 3 on the neck and trigone.

Single ulcers limited to the anterior wall have been seen by Strauss and Jacquet.

*Complications.*—It is relatively rare for tuberculous ulcers to penetrate the bladder wall; when perforation occurs it is usually found in the base. I have observed two instances: One in the superior part of the bladder, which extended to the rectus muscle, with abscess formation; the other perforation had occurred through the trigone into the prostate.

Guon has reported a number of ulcerations through the base. Denzel found one which extended to a pocket behind the prostate. A similar instance was observed by Dittel. Muster, in a girl of 18, discovered a fistula from the bladder into

the vagina Barlow noted a communication between the posterior urethra and rectum Lichtwitz and Ungerer record fistulous openings from a tuberculous bladder into the groin Bovis noted a tuberculous fistula which ran from the bladder to the umbilicus, it was thought that the urachus had not entirely closed and had been made larger by the tuberculous process Denzel observed an aperture from the bladder into the peritoneum resulting in peritonitis and death Hewett examined a perforation of the abdominal wall between the umbilicus and symphysis and another breach in the same bladder which joined it with the rectum Bryson, Pousson, Lane, Marchand and Schücking have seen fistulous tracts between the bladder and the rectum Englisch noted a connection of the bladder with the small intestine Winckel, in a study of 2505 autopsies in the female, detected 4 tuberculous ulcers which had penetrated the bladder wall

McCabe and Clado found diverticula in two cases, in the record of the former the sac was larger than the bladder

Phosphatic concretions have been observed over the surface of tuberculous ulcers, and well-formed stones have been repeatedly found Bocaloglu and Gleize report an instance in which a large stone had formed in a tuberculous bladder, ulcerated through the rectum, and presented itself at the anal orifice

#### ASSOCIATION OF TUBERCULOSIS OF THE BLADDER WITH THAT OF THE OTHER GENITO URINARY ORGANS

In 411 cases out of a collected series of 447, the involvement of the other genito-urinary organs was specifically stated The result is as follows

|                                                    |     |
|----------------------------------------------------|-----|
| Bladder and kidney                                 | 119 |
| Bladder and prostate                               | 33  |
| Bladder, prostate and epididymis                   | 30  |
| Bladder, kidney and prostate                       | 28  |
| Bladder and epididymis                             | 26  |
| Bladder, kidney, prostate, vesicles and epididymis | 26  |
| Bladder, kidney, prostate and epididymis           | 24  |
| Bladder, prostate, vesicles and epididymis         | 23  |
| Bladder, kidney, prostate and vesicles             | 13  |
| Bladder, tubes and uterus                          | 12  |

|                                                   |    |
|---------------------------------------------------|----|
| Bladder, kidney and epididymis.....               | 11 |
| Bladder, vesicles and epididymis.....             | 11 |
| Bladder, prostate and vesicles.....               | 10 |
| Bladder, kidney, vesicles and epididymis.....     | 7  |
| Bladder and Fallopian tubes.....                  | 6  |
| Bladder and vesicles.....                         | 6  |
| Bladder, kidney, Fallopian tubes and uterus.....  | 4  |
| Bladder, kidney, Fallopian tubes and ovaries..... | 2  |
| Bladder, kidney and ovaries.....                  | 2  |
| Bladder, kidney and tubes.....                    | 2  |
| Bladder, kidney and uterus.....                   | 2  |
| Bladder, tubes and ovaries.....                   | 2  |
| Bladder, tubes, ovaries, uterus and vagina.....   | 2  |
| Bladder, tubes and vagina.....                    | 2  |
| Bladder, kidney, Cowper's gland and urethra.....  | 1  |
| Bladder, kidney, tubes and vagina.....            | 1  |
| Bladder, kidney and urethra.....                  | 1  |
| Bladder, kidney and vagina.....                   | 1  |
| Bladder, kidney and vesicles.....                 | 1  |
| Bladder, ovaries, uterus and vagina.....          | 1  |
| Bladder and uterus.....                           | 1  |
| Bladder and vagina.....                           | 1  |

In 22 instances of bladder tuberculosis in the Johns Hopkins Hospital Pathological Laboratory, the other genito-urinary organs affected were as follows:

|                                                         |   |
|---------------------------------------------------------|---|
| Bladder, kidney, (8 with ureter).....                   | 9 |
| Bladder, kidney and epididymis.....                     | 3 |
| Bladder, kidney, prostate and epididymis.....           | 3 |
| Bladder, kidney and prostate.....                       | 3 |
| Bladder, kidney and ovary.....                          | 1 |
| Bladder, kidney, prostate, vesicles and epididymis..... | 1 |
| Bladder, kidney and uterus.....                         | 1 |
| Bladder, prostate and epididymis.....                   | 1 |

#### THE ASSOCIATION OF BLADDER TUBERCULOSIS WITH THAT OF OTHER SINGLE ORGANS.

|                                             |     |
|---------------------------------------------|-----|
| Bladder and kidney.....                     | 245 |
| Bladder and prostate.....                   | 187 |
| Bladder and epididymis.....                 | 158 |
| Bladder and vesicles.....                   | 97  |
| Bladder and ureters.....                    | 67  |
| Bladder and tubes.....                      | 33  |
| Bladder and urethra (with prostate).....    | 31  |
| Bladder and urethra (without prostate)..... | 7   |

|                              |     |
|------------------------------|-----|
| Bladder and urethra (female) | 4   |
| Bladder and uterus           | 22  |
| Bladder and vasa deferentia  | 19  |
| Bladder and ovaries          | 9   |
| Bladder and vagina           | 8   |
| Bladder and Cowper's gland   | 1   |
| Bladder and lungs            | 134 |
| Bladder and bone             | 15  |
| Bladder and intestine        | 8   |
| Bladder and liver            | 5   |
| Bladder and peritoneum       | 4   |
| Bladder and spleen           | 4   |

*Primary Genito-Urinary Tuberculosis*—I have searched the histories carefully in order to determine in what number the tuberculosis had originated in the genito-urinary tract I have taken for granted, when the lungs are said to have been healthy, and no mention is made of implication of any other organs that the disease was probably primary in the genito-urinary tract I have presumed also that this was first involved, when the chief description was confined to it and no mention was made of tuberculosis in any other part of the body According to the above explanation, I found 145 cases in which the process seems to have commenced in the genito-urinary tract They are as follows

|                                           |       |
|-------------------------------------------|-------|
| Lungs stated to be negative               | 39    |
| No mention of other organs                | 54    |
| Primary in genito-urinary organs (stated) | 52    |
|                                           | <hr/> |
|                                           | 145   |

*Secondary Genito-Urinary Tuberculosis*—In 122 cases the primary focus was mentioned, but in 17 not definitely stated

|                            |    |
|----------------------------|----|
| Primary in lungs           | 74 |
| Primary in bone and joints | 15 |
| Primary in glands of neck  | 7  |
| Primary in pleura          | 7  |
| Primary in skin            | 2  |
| Primary focus indefinite   | 17 |

*Order of the Invasion of the Genito Urinary Organs*—In 279 instances there were sufficient data to enable one to

form an approximate idea as to the invasion. The kidney seemed to be first implicated in 184; the epididymis in 80; the prostate in 6; the fallopian tubes in 6; the seminal vesicles in 2; and the uterus in 1. In perhaps many more some portion of the genito-urinary tract was the primary seat of the tuberculosis, but the history was not given with sufficient clearness to afford certainty on this point.

From the above it is seen that the two organs from which the bladder is most frequently infected are the kidney and the epididymis, the former source supplying by far the larger number of cases. From the epididymis, the disease spreads along the vas and affects the seminal vesicles and prostate, later implicating the posterior urethra and bladder. The testicle, in contradistinction to the epididymis, is so exceptionally the primary seat of disease, that practically it need not be considered as a point of origin. In my opinion the prostate is not often primarily affected, but I would hasten to add that Koenig, Tuffier, Simmonds and Krzywicki are of the contrary opinion and hold that it frequently contains the initial focus. Heiberg in a series of 31 cases of secondary genito-urinary tuberculosis, found the process limited to the prostate in three instances; but in his primary series of 14, it was never affected alone. Krzywicki in 14 collected cases of tuberculosis of the prostate records two similar examples and Collinet has also described two.

That the vesicles may provide the genito-urinary source of origin of the disease is undoubted, but it is generally admitted that the invasion is usually secondary; a few instances of tuberculosis confined to them, however, have been observed by Oppenheim, Kocher, Orth and Dreyer.

#### ETIOLOGY.

The bladder is very resistant to tubercle bacilli and may withstand their continued presence for months or even years without becoming infected. This has been shown numbers of times in cases of tuberculosis of the kidney, in which the urine has been full of tubercle bacilli for months and yet the

bladder has remained entirely uninfected. Experimental work also abundantly proves this point.

The bladder is rarely affected primarily; the only exception is that recorded by Saxtorph, who in 10,016 general autopsies, in a single instance found the female bladder to contain the only focus of tuberculosis in the body. Heiberg observed at autopsy a tuberculous female bladder, the remaining genito-urinary organs being free, but in this case the process was secondary to an infection in the glands of the neck.

Clinically, primary bladder tuberculosis has been reported often, but as the pathology is being more carefully studied, we are becoming convinced that these reports were erroneous. I feel justified, therefore, in saying that while primary tuberculosis of the bladder is a possibility, for practical surgical consideration its existence may be disregarded.

Tuberculosis of the lungs and of bone seem to be more frequently followed by tuberculosis of the bladder than of any other organ. In 394 autopsies which showed disease of the lungs, there were 16 instances of implication of the bladder, 13 times in connection with chronic, and 3 times with general miliary tuberculosis. In 45 cases of bone tuberculosis the bladder was affected 4 times.

*Experimental Work*—I have injected virulent tubercle bacilli into the bladders of a series of rabbits under different conditions, (1) into the normal bladder, (2) into that organ after having curetted the mucous membrane, in neither series have I been able to produce an infection. I have this work still in progress and will give a full report later.

Hanau introduced tubercle bacilli into the urethra of guinea pigs and succeeded in inducing tuberculosis of the urethra and bladder.

Rovsing has demonstrated that tuberculosis of the bladder cannot be produced by injecting tubercle bacilli into it even if they be allowed to remain 24 hours, but he did succeed after contusing the mucous membrane and keeping the organisms imprisoned for 20 hours.

Baumgarten caused a tuberculosis of the posterior urethra,



prostate and neck of the bladder in rabbits, by instilling the bacilli deeply into the urethra.

Hansen, in 16 cases of artificial tuberculosis of the kidney, had two in which infection of the bladder subsequently developed. In 7 other animals, he injured the mucous membrane of the bladder very extensively, and then injected tubercle bacilli; 4 of these experiments gave positive results.

*Pyogenic Organisms.*—It is impossible to state the exact influence which pyogenic cystitis exerts upon the infection from tubercle bacilli, but it is probable that such an inflammation lowers the resistance of the mucosa, and produces minute breaks in the surface, which allow the tubercle bacilli to enter the submucosa. On the other hand, the increased blood supply and the extensive infiltration of leukocytes and lymphoid cells, together with a possible inhibiting influence of the toxins of certain pyogenic bacteria, may offer definite resistance to the tuberculous invasion.

The inhibition of pyogenic toxins just mentioned has not been proved and may not exist at all, for we see many specimens from kidneys, bladders, intestines and other organs in which pyogenic bacteria and tubercle bacilli have grown together on apparently very friendly terms. Nevertheless, it would seem that a cystitis caused by members of the proteus group or certain varieties of the colon bacilli does not offer so fertile a field for the invasion of tubercle bacilli as that produced by streptococci and gonococci. These last two organisms unquestionably are good forerunners for tuberculosis.

It can be stated, however, that in no case of cystitis, be it ever so bad, does the bladder ever become infected with tubercle bacilli even if tuberculosis of the lungs, bone or other part, exists, unless some other portion of the genito-urinary tract is implicated.

In this connection it must be insisted that all patients who have any focus of tuberculosis in the genito-urinary organs should be protected as far as possible from anything which might give rise to a cystitis, and that when such does occur it should receive more than ordinarily careful treatment.

*Gonococci* —The question as to the predisposing influence of gonorrhœal inflammation is not definitely decided, but in view of the fact that a number of cases of bladder tuberculosis have followed closely upon acute gonorrhœal urethritis and cystitis, it would seem highly probable that an attack of gonorrhœa occurring in individuals suffering from tuberculosis of the kidneys or epididymes may favor the development of a bladder tuberculosis. It must be stated, however, that about 85 per cent of adult males, and a fairly large proportion of adult females, have had a gonorrhœa at some time during their lives, so that the relationship is possibly more co-incidental than real.

In 135 cases of my collected series gonorrhœa was stated to have been present in 71 and denied in 64. In a few the tuberculosis followed the acute attack, but in most of them it was remote.

Casper saw two instances of bladder tuberculosis develop immediately after an attack of acute gonorrhœa, so far as he could discover there had been no tuberculous focus in the body before and Casper thought that the tubercle bacilli had been directly implanted on the injured mucosa. How they gained entrance he does not state. Such a conclusion is certainly open to question.

Cornil, Babes, Motz, Halle and Bloodgood have found gonococci and tubercle bacilli associated in the urine. Routier and Hollander have reported a cystitis which followed an acute gonorrhœa and which later was proved to be tuberculous.

Loomis, in a patient who had had for some time a cough and occasional pain in the region of the kidney, observed frequent and painful micturition following an acute gonorrhœa, the process proved to be tuberculous and ran a rapidly fatal course. It is probable that the patient had a primary disease of the kidney and that the gonorrhœa caused the bladder to become affected, thus increasing the rapidity of the whole process.

*Sexual Intercourse* —It is possible that either the male or the female may become infected during coitus, but such an

occurrence is extremely rare, and the few instances which have been reported are open to doubt. If such an infection does occur, it is more likely to happen to the female, the tuberculous semen being deposited in the vagina and remaining for several days in contact with the cervix or making its way into the uterus.

Greize reports the case of a male of 37, who was thought to have been infected by a woman suffering from tuberculosis of the cervix. Gracienescu mentions the case of a female who, after cohabitation with a man suffering from local tuberculosis, developed the disease.

Schüchardt believes in the danger, and has observed a tuberculous ulcer develop on the glans penis after intercourse. In another instance he examined a female who had a very severe and acute inflammation of the vagina, the secretions from which showed gonococci and tubercle bacilli; this condition had developed after intercourse with a tuberculous male. In this connection, it is interesting to note that tubercle bacilli have been found, by Jani and Nakarai, in normal prostates and testicles of individuals suffering from pulmonary tuberculosis. The virulence of these bacilli was proved by Nakari, who inoculated them into animals. The germs may thus be present in the semen, in the absence of lesions of the genital organs, but these organisms must of necessity be few and can play no role as infective agents.

*Instrumentation.*—In individuals suffering from tuberculosis of the kidney, prostate or epididymis, the insertion of metal instruments, or stiff catheters, may wound the vesical neck or bladder mucosa, and afford a starting point for a bladder tuberculosis. It behooves us, therefore, in all cases of this kind to limit their introduction and, when indispensable, to practise the procedure only with extreme care and delicacy.

*Means of Infection.*—Theoretically the bladder may become infected by the blood or lymph, but since it is so rarely involved alone and since even in general miliary tuberculosis miliary tubercles in the bladder are very seldom found, much doubt is thrown upon the occurrence of infection through these channels.

A case occurring in the Johns Hopkins Hospital, in which some of the physicians thought that implication of the bladder had occurred in this way, may be cited as an example. The patient had had no bladder disturbance, nor change of urine during life, at the autopsy there were discovered two gray tubercles (miliary) in the trigone and a few in both kidneys, the other genito urinary organs being free. Here there is a possibility, of course, that the tubercle bacilli may have been conveyed to the bladder by the blood or lymph, but on the other hand, they most certainly could have come down from the kidneys.

The two principal modes of infection then, are First, from the kidney above, and second, from the epididymes, prostate and vesicles below. The tubercle bacilli from the kidney enter the bladder in two ways (1) They may pass by direct extension from the mucous membrane of the ureter to that of the bladder, (2) they may be brought down in the urine, and enter the submucosa through some microscopic fissure. From the prostate below, they either enter by direct invasion through the base of the bladder, or implicate first the prostatic urethra and then the bladder mucosa.

Extension from the peritoneum directly through the bladder wall is spoken of as a possibility, but there are no undoubted observations to confirm it. I have been unable to find any evidence of such a penetration in the specimens which I have examined.

It is thought to be possible by some observers that the disease may extend from the rectum into the bladder, such an occurrence I have found neither in the literature nor in my personal experience.

*Traumatism*—Trauma of one kind or another may prove a predisposing factor, but there are no recorded instances to substantiate this opinion.

*Diseases of the Urethra*.—In cases of genito-urinary tuberculosis, inflammatory thickening, particularly when it gives rise to the formation of stricture, seems to be a predisposing factor in inciting the development of bladder tuberculosis.

Crismore, Motz, Hallé, and others have reported instances in which the stricture had a very baneful influence. Jamin observed a lighting up of a very severe cystitis, presumably tuberculous, after dilatation of a urethral stricture.

*Stone* has been found not infrequently associated with bladder tuberculosis. In some subjects it has preceded the development of the disease several years. Bacaloglu and Gleize report the case of a patient who had suffered a long time from attacks of cystitis which alternated with periods of improvement; these attacks gradually became worse, and at the operation a stone the size of a pigeon's egg, weighing 25 grammes, was removed; some time later tubercle bacilli were discovered in the urine, and tuberculosis of the epididymes and prostate developed.

Carleton observed a man who had complained for a long time of symptoms of bladder stone. At the operation a large calculus was found and the bladder mucous membrane was tuberculous.

In the Johns Hopkins Hospital there were about thirty small stones removed from a tuberculous bladder; calculi continued to form for several months and were taken out from time to time.

*Heredity.*—There were 100 cases in which were recorded notes as to the presence or absence of tuberculosis in the family; 55 patients acknowledged that some member had suffered from the disease, 45 denied it. It is probable that the hereditary tendency (as now understood) plays the same part in tuberculosis of the genito-urinary organs as it does in other parts of the body.

*Habits.*—The records were not full enough for me to determine whether the use of alcohol, excessive sexual indulgence, and other forms of dissipation acted as predisposing agents; my own opinion, however, is that a virtuous life does not materially lessen the chances of infection of these organs by tuberculosis.

*Professions, Trades, Etc.*—Accurate statistics in regard to this point were not forthcoming, but I feel sure that the

larger proportion of cases of genito urinary tuberculosis will be found among laborers and those who have been compelled to lead lives of exposure and hardship

*Sex*—Of 438 patients of whom the sex was given, there were 285 males and 153 females. The statement of some observers that the disease is quite as common in females as in males—perhaps even more common—must certainly be incorrect, because in the male there are additional sources of infection—epididymes, prostate, vesicles, to which in the female there are no organs that are analogous in this connection. Indeed, in the female the kidney is practically the only source of infection. In order, however, to be entirely just, I will state that in this study I have been particularly interested in male tuberculosis and possibly may unintentionally have overlooked some females.

*Age*—The youngest patient (condition found at autopsy) was a child of two years (Peroud), the oldest was a man of 97 (Tapret). Ammond's patient was a child of  $3\frac{1}{2}$  years. Horwitz's 3 years, West's 4 years, Moullin had one of 4 years, and a man of 70 years of age. The age according to decades is as follows

| IN THE MALE |           | IN THE FEMALE |           |
|-------------|-----------|---------------|-----------|
| I to 10     | 4         | I to 10       | 2         |
| 11 to 20    | 32        | 11 to 20      | 20        |
| 21 to 30    | 94        | 21 to 30      | 37        |
| 31 to 40    | 70        | 31 to 40      | 26        |
| 41 to 50    | 50        | 41 to 50      | 11        |
| 51 to 60    | 14        | 51 to 60      | 2         |
| 61 to 70    | 6         | 61 to 70      | 5         |
| 71 to 80    | 0         | 71 to 80      | 1         |
| 81 to 90    | 0         | 81 to 90      | 0         |
| 91 to 100   | 1         | 91 to 100     | 0         |
|             | <hr/> 271 |               | <hr/> 104 |

The average age in females as obtained from 104 cases is 37.78 years, the average age in males in 271 cases is 33.26 years.

## SYMPTOMATOLOGY AND DIAGNOSTIC DATA.

THERE is no one sign nor symptom, nor is there a definite symptom-complex which indubitably proves the presence of tuberculosis of the bladder. Direct inspection only can justify an absolute diagnosis. The same frequent and painful micturition and the general bladder distress which accompanies tuberculosis of that organ is also produced to nearly the same degree of intensity by tuberculosis of the kidney, and almost the same symptomatic picture is presented by certain cases of tuberculosis of the prostate. This fact has been proved often by autopsies and cystoscopic examinations. A very interesting example has been recorded by Keys, in which a patient was compelled to urinate every 5 or 10 minutes, and yet at autopsy there was disclosed no implication of the bladder.

The localized symptoms most generally met with are frequent and painful micturition, a dull aching sensation in the pelvis, and the presence of pus, tubercle bacilli and blood in the urine. The general symptoms are a gradual loss of flesh, an increasing anæmia, an irregular temperature, occasional chills, etc.

It should be stated, however, that tuberculosis of the bladder rarely presents a picture entirely due to the disease of that viscus, for the reason that some one or the other genito-urinary organs is generally implicated.

Frequency and pain with micturition will be discussed first together, because they are so often associated, and then singly.

In 294 reports in which the symptoms were given, there were 201 which gave this as a prominent complaint in some stage of the disease. In a number of others, it was not specifically stated that pain and frequency of micturition were met with together, but from other signs present, it is presumable that such was the case; if such cases are added to the above list, the proportion would be much larger, so that I do not think I should err in saying that over 95 per cent. present the combination of frequency and pain with micturition. This complex sometimes occurs at intervals, remains for a few days

or even several weeks, and then passes off almost entirely for a variable period, such free intervals and recrudescences covering several years. This type is exceptional, the general rule is a steadily downward progress, the pain becoming greater and micturition more frequent.

As an example of the above, one of my patients twelve years ago had an attack of cystitis (with frequent and painful micturition), which lasted for three days, this entirely disappeared and there was no further trouble for three years, when a second attack occurred. This was soon followed by others, and after a while the intervals became shorter and shorter until finally the suffering became continuous.

*Frequency of Micturition*—In the very beginning, there is an augmentation in the quantity passed, but no change in the frequency of urination. Soon there is noted an increase in the number of times during the day and the patient, who has before slept all night, is now forced to get up once or twice. This frequency gradually increases as the disease progresses and is accompanied by burning and pain. The intervals become shorter and shorter the average in the later stages being from 20 to 30 minutes, in the more extreme cases, micturition occurs every 5 to 10 minutes during the day and night. Bassett and Perkins observed a case in which the patient passed water every 5 minutes, Routier recorded an instance of 40 micturitions during the day and the same number during the night. One of my patients had 27 calls during the daytime. In women it is sometimes necessary to wear a napkin.

This symptom is neither relieved by rest nor increased by exercise nor is it diminished to any extent at night. The underlying cause of frequent urination in bladder tuberculosis is the irritation of the vesical neck and floor of the prostatic urethra by the morbid process. This renders the nerve endings which normally control the phenomenon of micturition much more easily impressed consequently the bladder becomes intolerant of much fluid. In the bladders which show an implication of the superior half, with a comparatively free base frequent micturition is not prominent.



*Pain.*—At the very first pain is usually absent. As the disease advances, it becomes more and more in evidence, and toward the last stage is sometimes intolerable; it is described as dull, aching, occasionally sharp or lancinating; it is felt at the beginning of, during, or at the end of micturition; most frequently, however, pain accompanies the whole act, with an exacerbation at the end. It may be transmitted all along the urethra, or confined to the prostatic portion, and in a few patients it is felt only in the glans penis. After micturition it continues for several minutes, but is not acute, the patients describing it as a dragging, burning sensation. It is usually associated with frequency, but to this there are a few exceptions. In two cases in the Johns Hopkins Hospital, there was marked frequency but no pain. Guyon and others have noted similar instances. In a few the pain was the initial symptom and remained for some time before any other bladder disturbance was noted. It is transmitted occasionally to the perineum, to the suprapubic region, down the legs, and to the renal region; sometimes the pain is continuously present and is of a very sharp neuralgic type, extending over the whole back.

The pain is produced by the ulceration and tuberculous process in and near the vesical neck, and is intensified by the contraction of the bladder during and after micturition. When only the superior half of the organ is affected the pain is very much less and may be altogether absent.

*Changes in the Urine.*—It is difficult to state the exact alterations in the urine caused by bladder tuberculosis, for the reason that this process is usually complicated by tuberculosis of the kidney or prostate. Given then, an unusual condition in which the bladder has become infected from the epididymes, prostate, or vesicles, and where the focus does not communicate with the urethra, the very first change would be an increased secretion of urine due to excitation of the kidneys. Following very soon upon this augmentation in the urine, pus and exfoliated bladder epithelial cells appear, along with a few red corpuscles and possibly some tubercle bacilli. As the disease advances the pus becomes much greater in quantity, the blood

is more in evidence, and the tubercle bacilli are more readily demonstrated. Still later, in the stage of ulceration, there is added to the above debris consisting of necrotic and cheesy material.

The reaction in the majority of urines is acid. In 46 recorded analyses, 28 urines were acid, 14 were alkaline, 3 were ammoniacal, and 1 was neutral. The average specific gravity was 1018, the lowest was 1006 and the highest was 1022. The urea varied from 8 to 13 grammes per litre. The phosphoric acid ( $P_2O_5$ ) ranged about 0.65. The chlorides, according to a late investigation by Bignon are usually increased, particularly when the kidney is involved. There is no reason for any alteration of the chemical constituents of the urine in tuberculosis of the bladder except as a result of reflex stimulation of the kidney, the real deviation from normal in this respect is induced by disease of the kidney.

*Blood*—Hæmaturia is not so infrequently the first symptom, and may be present at intervals for a number of years before any bladder distress or other signs show themselves.

In 146 cases bleeding was noted at some stage of the disease, in 20 it was an initial symptom. There is no absolutely characteristic sign which under all conditions will enable us to differentiate between blood from the kidney and blood from the bladder, except the evidence of cystoscopic examination. Usually the blood coming with the last portion of urine, or at the end of micturition, signifies that either the bladder or vesical neck is its source, homogenous red urine may indicate bleeding either from the bladder or kidney, if it comes from the bladder it means that there is an extensive process of some kind present. If this can be reasonably excluded, the bleeding is presumably renal in origin.

The periods of bleeding vary in duration from a few hours to several weeks and occur at intervals of weeks, months, or even years, they are most frequently met with in the first stage of the disease and tend to diminish toward the end, the quantity of blood lost, as a rule, is small, sometimes, however, it is large, and exceptionally it has been sufficient to endanger life.

Clado observed a patient who bled continuously for  $1\frac{1}{2}$  years. Pierchon cites an initial symptom of profuse bleeding which was prolonged for several weeks. Raymond had a patient who suffered from bleeding at intervals for 7 years before bladder distress developed. Casper's patient had had hæmaturia for 5 years prior to the appearance of any other sign of tuberculosis. In one of Raillaird's cases there was paroxysmal hæmaturia for eighteen years; in one of Talayrach's for three years. Horwitz observed one case in which bleeding occurred at intervals for three years before the cystitis began. These were all probably instances of primary renal tuberculosis.

The hæmaturia is caused in two ways. First, in the earlier stages, when there is much congestion and some ulceration, the blood is squeezed out by the contractions of the bladder; secondly, later when the ulceration is more extensive, the blood vessels may become eroded and the blood be poured out in larger quantity.

*Tubercle Bacilli.*—These organisms were frequently reported as absent; this I take to be the result of inadequate examinations, for a careful search will always reveal them. They were recorded as present in 110 cases—in a little over 50 per cent. of the histories in which the results of an examination were given.

The presence of tubercle bacilli in the urine does not always mean that tuberculous lesions are present in the bladder, for it has been proved that they may be excreted by the kidney and appear in the urine in the absence of any disease of the urinary tract. Israel on two occasions found them in the urine of a patient who at autopsy showed a complete absence of genito-urinary tuberculosis. Thilicwicz disclosed their presence in the urine in a case of miliary tuberculosis which at autopsy showed no local lesions. The observations of Jani and Nakarai have already been mentioned.

*Pyogenic Organisms.*—The most common secondary bacteria present in the urine, as before stated, are colon bacilli, diplococci, streptococci, and members of the proteus group.

These, particularly colon bacilli, are usually present in the terminal stages. Members of the proteus group are seen in the ammoniacal and occasionally in other alkaline urines. Gonococci have been demonstrated a few times.

The total quantity of urine passed in the twenty four hours varies with each individual case, but is liable to be somewhat above normal. The smallest quantity, 800 cc., was observed by Battle in a ten year old girl, the largest amount 2500 cc., occurred in a male of 47 (Bignon), the average quantity was 1660 cc. Sondern in 74 cases found the average to be 1430 the largest was 2200 cc. and the smallest was 720 cc.

The capacity of the bladder is diminished. This as demonstrated in 41 cases averaged 97 cc. the smallest was 20 cc. (Catron) and the largest was 420 cc. of these 41 bladders, 27 had a capacity of under 100 cc.

*Cystoscopic Examination*—In the bladders which have been infected from the kidney, we see on the corresponding side on cystoscopic inspection an irregular ureteral orifice with some swelling and redness on the edges and a slight congestion of the surrounding mucous membrane, with the occasional presence of a few reddish papules. This picture does not represent a true tuberculosis, but is rather that of irritation produced by the tuberculous toxins. Later there is seen an increase in the red zone and the formation of definite tubercles which appear as fine gray points with a faint reddish zone surrounding them. In a short time this picture is succeeded by another, which shows a development of more tubercles, with an aggregation, coalescence, and secondary loss of substance and the consequent formation of one or more minute ulcers. *The mucous membrane in this stage is otherwise normal, except for a slight congestion in the trigone and vesical neck.* A still later examination discloses an extension of the ulceration toward the trigone, or upward and backward on the posterior and lateral surfaces. Following this increased ulceration, the whole mucosa not infrequently becomes injected and slightly swollen, and presents the picture of a cystitis, this is particularly true when there has been a secondary invasion. In the

last stages there is a very extensive ulceration of most of the mucous membrane and in many places an exposure of the muscular coat.

When the disease comes up from the prostate, nearly the same picture is presented with the exception of the above mentioned initial and probably non-tuberculous stage; the lesions, of course, are differently located, being near the vesical neck and in the trigone. In this type there seems to be a more rapid development of tubercles, with an earlier breaking down and ulceration, the more rapid course being probably due to the situation of the lesions which are thus subjected to more irritation from the contractions of the bladder.

*Tuberculous Ulcer.*—The outline is irregular; there is a general tendency toward a circular form with irregular projections; the edges are ragged, red, swollen, slightly indurated, and overhanging; the base is covered with an uneven, very delicate granulation tissue, over which are scattered yellow and gray flakes of fibrin. The mucous membrane immediately surrounding the ulcer is diffusely reddened and no individual blood vessels can be seen; outside of this is a less reddened zone, where they are more distinct. The ulcer varies in depth; usually it does not penetrate farther than the submucosa tissue, but occasionally it passes through this and exposes the muscle, which in turn it erodes.

According to descriptions found in the literature, the ulceration in a majority of instances begins in the region of the ureter; the individual ulcers range in size from that of a pin-head up to that of a silver dollar; usually several are present, but single ones have been noted by Strauss, Reynès and Battle.

*Unusual Conditions.*—Stoeckel observed a bladder whose base was covered with polypoid excrescences; these were very small, and for the most part were translucent; some of them were slightly reddened; there were no tubercles, no ulcers; tubercle bacilli were not found at first, but were discovered later. Mirabeau has made a similar observation in a case which also proved to be tuberculous.

Malherbe saw a brownish mass which at first was taken for a tumor, but later at operation was shown to be a tuberculous process

*Incontinence* — Three kinds of incontinence are met with (1) The true form which is brought about by the destruction of the vesical neck, (2) that of dribbling from over distention (3) that caused by an exaggerated and imperious desire to micturate True incontinence is observed only in the last stages, when the disease has become extensive, infiltrative and destructive The over distention type is produced either by some obstruction in the prostatic region, or by grave implication of the muscle which weakens it and allows the bladder to distend In the last form the urine begins to flow as soon as the desire is felt

*Retention of urine* is sometimes seen It occasionally appears very early, and the first thing that draws the attention of the patient to any abnormal state is that he suddenly becomes unable to urinate and is compelled to have recourse to a catheter Retention is brought about in four ways (1) By irritation around the vesical neck which produces a spasmodic constriction, (2) by the implication of the prostate or the swelling of the tissues around the neck of the bladder which forms an obstruction, (3) by hindrance of the outflow by a blood clot, (4) by more or less complete destruction of the muscle wall of the bladder which so weakens it that the viscus has not sufficient force to expel the urine

*Tuberculosis of the Bladder Without Symptoms During Life* — Every now and then one finds at autopsy a more or less extensive disease of the bladder which has produced no symptoms before death In such instances it is usually the superior half of the viscus which has been invaded

Stein saw at autopsy a number of ulcerations at the summit of the bladder, the patient having complained of no disturbance of micturition Kidd observed a very extensive ulceration of the mucous membrane, which had caused no bladder distress Smith saw a single ulcer which was not known to have caused any discomfort before death In three

patients in the Johns Hopkins Hospital there had been no trouble with the bladder, but at autopsy lesions were found; in the first there was a decided implication of the mucous membrane; in the other two there were several fine gray tubercles in the trigone.

*Loss of Flesh.*—In the early stages of bladder tuberculosis, the patient retains his weight to a remarkable degree and occasionally gains from time to time; it is the rule, however, in the latter half to have loss of flesh, which in the terminal stages becomes rapid. This cannot all be ascribed to the disease of the bladder, for there are other tuberculous foci present which are preying upon the patient. Again, the emaciation is in part directly due to exhaustion and loss of sleep, caused by the frequent and painful micturition.

*Anæmia.*—A certain degree of pallor is observed very early, although some persons retain their color for a long time; later the anæmia is very pronounced and the blood presents the same changes as in tuberculosis of other organs.

*Fever.*—This is a late symptom, is of irregular type and ranges from 99° to 103° F. Chilly sensations and occasionally definite rigors precede the rise in temperature.

*Pulse.*—The pulse sympathizes with the general weakness and the temperature.

*Complications.*—The main complications are infection by pyogenic organisms, stone, stricture, and prostatic abscess. Secondly, of course, we may have those following perforation of the ulcer into the surrounding structures. Infection by pyogenic bacteria and the presence of stone have been discussed already. Stricture has been observed several times in this connection, and often aggravates the other symptoms and increases the rapidity of the course of the disease. Typical instances have been recorded by Motz, Crismore, and others. Prostatic abscess often complicates tuberculosis of the bladder; it produces retention, great increase in the pain, local swelling and discomfort in the perineum. Perforation into the large or small intestine, may allow all the water to be discharged into the bowel, greatly increases the suffering, and hastens the

end Perforation into the peritoneum produces peritonitis and death Opening into the perineum, behind the prostate, or into the suprapubic region gives rise to abscess formation with its consequent train of symptoms

*Duration of Symptoms*—Inasmuch as bladder tuberculosis in every instance is complicated by other conditions, such as tuberculosis of the kidney or prostate, primary stone and primary simple cystitis, it is impossible to state with precision how long tuberculosis of the bladder had been present in the cases which I have analyzed In the following calculation I have estimated the time from the date of the first symptoms up to the time at which the patient first came under the observation of the recorder of the case This method must of necessity be inaccurate, for the records are indefinite—for instance, the following phrases are used “Blood at intervals for 5 years, later painful and frequent micturition” “Cystitis to some extent for 10 years, several years later increased frequency with pain,” “Symptoms of stone for 4 years, then tuberculosis developed” Such cases may or may not have been tuberculous from the beginning, possibly in some the process at first was simple and a tuberculous infection occurred only later With the above explanation, I will state that I have computed the time in 172 cases, and find that the average duration of the bladder tuberculosis from the beginning up to the date of the history is 25 21 months The shortest time was 14 days and the longest 11 years The duration of symptoms from the beginning to the time of death, as calculated from the histories in which the dates were given is 35 05 months, or in round numbers 3 years

(To be continued)



RECURRENT INTERMITTENT RETENTION OF  
URINE OCCURRING WITH THE REMISSIONS  
IN A CASE OF PERNICIOUS ANÆMIA—THE  
FINAL RESULT OF A BOTTINI OPERATION  
FOR ASSOCIATED PROSTATIC HYPERTROPHY.

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THE interest in this case is the recurrent intermittent retention of urine dependent upon remissions or exacerbations of anæmia in the course of a pernicious anæmia.

The purpose of this report is not to arrive at any definite conclusions, but to place on record an etiological factor producing intermittent retention of urine not heretofore mentioned, so far as the writer is aware. The case also illustrates the sequelæ of urinary retention; the benefit derived from a Bottini operation and the condition of the prostate three years following such an operation.

The changes in the blood during the course of the case are also of interest.

Male; widower; 47 years old; a native of New Brunswick; a teamster by occupation; entered the Boston City Hospital in the medical service of Dr. Henry Jackson, March 18, 1903. I wish to express my appreciation to this gentleman for the privilege of using the notes of this case while on his service.

*Family History.*—Father died of cancer of the throat; mother and wife with pneumonia; one child with tubercular meningitis. Two children living and well. No brothers or sisters.

*Past History.*—Measles in childhood. Otherwise always well. Denies venereal.

*Habits.*—Moderate use of tea, liquor and tobacco.

*Present Illness.*—For the past few weeks the patient has been unable to work on account of the fact that he becomes tired very easily. Headache has been a constant symptom, most

marked during the day. He becomes dizzy and gets out of breath on slight exertion. During the past week he has had difficulty in distinguishing objects both far and near. During the past few weeks his appetite has been very poor and there has been a constant diarrhœa not containing blood. Does not vomit. No cough. He has had several attacks of palpitation of the heart at which time he has felt dizzy and has been obliged to sit down. These attacks have lasted but a few moments and have occurred after exertion.

There has been a gradually increasing frequency of micturition during the past five years and four years ago he had complete retention at which time he had to be catheterized regularly for three months. When he was not catheterized the urine dribbled away, but he was unable to pass any voluntarily. The patient states that he now passes his water six or seven times during the night and every hour or two during the day that there has been increasing difficulty in starting the urine that it comes slowly and drops directly from the meatus and that dribbling follows the act. He states that the urine is cloudy and that a sediment settles to the bottom of the vessel. There has been no pain associated with urination and he has never passed blood.

The patient states that he has not lost much weight. His chief complaint is weakness headache vertigo and a difficulty in urination.

*Physical Examination*—A well developed and nourished man with a yellowish pallor. Eyes pupils motions and reactions normal no arcus senilis conjunctivæ pale. Tongue thick white coat pale in color. Throat very pale. Pulse equal regular fair volume and tension. Heart right border two fingerbreadths to right of sternum left border in nipple line apex in fifth interspace nipple line upper border third rib action regular a soft blowing systolic murmur is heard at the apex and is transmitted into the axilla the aortic second sound is accentuated. Lungs good resonance but numerous sonorous sibilant and medium moist rales are heard throughout both chests. Liver dulness extends from the sixth rib to costal margin edge not felt. Abdomen full lax and tympanitic not tender. In the hypogastrium a rounded tumor is palpable extending half way to the umbilicus which mass resembles a partially distended

bladder, both by palpitation and percussion. Extremities: moderate œdema about both ankles. Knee jerks and planter reflexes slightly increased. No glandular enlargement. There is a small inguinal hernia on both sides.

*Rectal Examination.*—Right lobe of the prostate slightly larger than the left. The median raphe is forced toward the left, the left lobe being normal in size. Both lobes smooth and of normal consistency, but the right lobe is rather less sensitive than the left. Both seminal vesicles are normal. Small external hæmorrhoids are present.

The urethra not instrumented. Temperature, 99°; pulse, 104.

*Urine Examination.*—Pale and turbid; sp. gr., 1005; alkaline; a trace of albumin; no bile or sugar; urea, .78. Moderate amount of sediment, which shows pus and squamous epithelium. No renal elements or crystals.

*Blood Examination.*—Leukocytes, 6000; red cells, 1,625,000; Hgb. 25 per cent.; marked poikilocytosis, macrocytosis and polychromatophilia. A differential count shows: Neutrophiles, 79 per cent.; basophiles, 19 per cent.; eosinophiles, 2 per cent. Three megaloblasts. One mast cell.

The patient was given Fowler's solution, iron preparations, and urotropine. He continued to run a temperature about normal and a pulse around 100.

*Blood Examination.*—Three days following entrance: Leukocytes, 8000; red cells, 1,200,000; Hgb., 15 per cent. Marked macro-, micro- and poikilocytosis and polychromatophilia; twelve megaloblasts and four normoblasts.

Five days following admission the patient complained that he was unable to pass any water. A tumor was evident over the pubes extending to the umbilicus and urine was issuing from the meatus in drops.

*Urethral Examination.*—A bougie à boule, No. 28 Fr. was passed to the anterior layer of the triangular ligament and withdrawn without meeting obstruction. A soft rubber catheter, No. 12 Fr., could not be passed into the prostatic urethra. A coudé, No. 12 Fr., was passed into the prostatic urethra, where it deviated about 30 degrees to the left during its passage through this portion of the urethra. Forty-five ounces of urine were withdrawn, and no hæmorrhage resulted. The coudé was tied in

position and siphon drainage established. The bladder drained well for four days, and was irrigated daily with a 4 per cent boric acid solution, the twenty four hours' amount of urine ranging between 38 and 45 ounces.

The examinations of the urine made were as at entrance. After the bladder had been drained for four days the catheter was removed because it became plugged with sediment. Following the patient was able to pass but a very small amount of urine at a time, and the bladder was constantly overflowing. A residual urine of 38 to 42 ounces was found at several different times.

The patient's chief complaint after being in the hospital one week was the retention of urine and it was believed that the obstruction was due to prostatic hypertrophy.

Fourteen days after admission a cystoscopic examination was performed by the writer through the courtesy of Dr Henry Jackson and Dr Abner Post.

*Cystoscopic Examination*—A soft rubber catheter No. 12 Fr., was passed into the bladder, meeting obstruction in the prostatic urethra, 800 cc of dirty urine withdrawn, bladder cleaned in about twenty minutes, bladder capacity 850 cc.

The deep urethra and bladder were cocaineized by an ounce of a 4 per cent solution, 250 cc of sterile water was introduced as an examining medium.

A simple concave indirect cystoscope was introduced easily to the apex of the prostate. When forced into the prostatic urethra it met obstruction and the beak deflected to the patient's left to about 30 degrees, and remained so during its passage through the prostatic urethra into the bladder. The bladder wall showed large roughæ deeply injected with many flacks of adherent fibrine (*chronic cystitis*). The trigone was distinct and also deeply injected. Both urethral orifices were found with an areola of dark congestion about them. They were normal in size and functioning at a normal rate. The urine ejaculated was clear. The vesical surface of the prostate showed two distinct clefts to the right of the median line. (See Fig 1.)

There was slight intravesical projection of the right lobe. No growths or foreign bodies seen.

*Bimanual examination* performed with the cystoscope in the bladder and the finger in the rectum. The prostate showed the right lobe to be slightly larger than the left. The consistency

rather firmer than normal. The left lobe normal in size and consistency. The surfaces of both smooth. The bladder wall is slightly thickened. The prostatic tissue posterior to the urethra not more than 1.5 cm. Tissue to the right of the prostate urethra over 3 cm.

Rotation of the beak over the vesical surface showed the right lobe to project about 2 cm. above the vesical orifice. The elevation was gradual in its decline anteriorly and posteriorly.

A

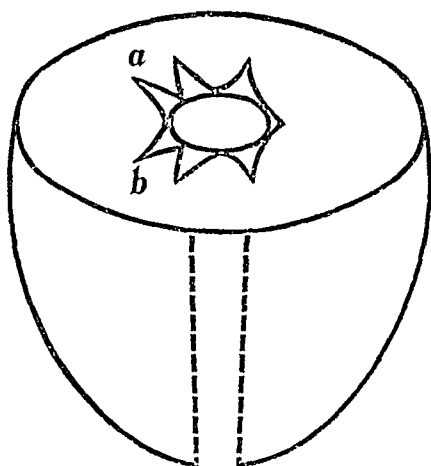
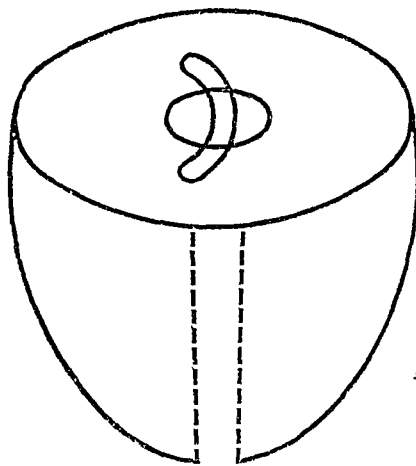


FIG. 1A.—Diagrammatic record of the cystoscopic fields at the vesical outlet, showing two clefts, *a*, *b*, a short distance to the right of a median line.

B



B.—The actual shape of the vesical orifice determined by transposing the inverted cystoscopic pictures recorded in A, showing the incroachment of the right lobe upon the urethra, deviating it to the left, narrowing it laterally and lengthening it antro-posteriorly.

The prostatic urethra was but slightly lengthened. In withdrawing the instrument the beak was rotated about 30 degrees to the left, where it remained during its withdrawal through the prostatic urethra. The passage was even and the resistance continual.

Part of the distending medium was passed voluntarily by the patient immediately after examination. It contained no blood, but was slightly turbid.

The patient voided his urine rather better for three days following the cystoscopic examination, as is so often the case,

but at the catheterization which was practised night and morning, the residual urine ranged between 28 and 36 ounces, and without the catheterization, the bladder became overdistended and dribbled constantly. The anæmia continued about the same, the patient's general condition not being improved.

*Bottom operation*, twelve days following the cystoscopic examination, performed through the courtesy of Dr Henry Jackson and Dr Abner Post.

The operation was performed under local cocaine anæsthesia. The 12 cm blade was used. The right lateral lobe was incised at a mid point for a distance of 1.75 cm at the rate of one minute to the cm out and 30 seconds of the first cm back and one minute on the last .75 cm.

There was no pain during the operation except at the last 25 cm going back. The cautery blade could not be heated beyond a dull red heat, because of some defect in the electrical connections.

It was originally intended to make two other incisions in the right lateral lobe one on either side of the median incision. The operation was considered to be incomplete, and the patient was returned to the ward with the idea of repeating the procedure when the electrical apparatus was repaired.

*Following Operation*—No suppression followed. The patient began to void his urine voluntarily. The urine was voided in three or four-ounce amounts at short intervals. The urine contained considerable blood and bits of sloughing tissue for about a week. These gradually disappeared.

Ten days following operation, the patient was catheterized for the first time and a residual urine of 12 ounces was obtained. A soft rubber catheter, No 18 Fr, was passed without difficulty. There was so much improvement in the patient's condition that further operative procedure did not seem advisable at that time.

The residual urine was tested every three days, and five weeks after operation was reduced to 6 ounces. The patient held the urine at longer intervals, from three to four hours, and passed it but twice during the night. The urine started easily, and passed freely but the dribbling after urination persisted. Examination of the urine was not different from that at the time of admission, except that the sediment contained a small amount of detritus, and a few blood corpuscles.

*Blood examination* at this date, five weeks after operation, was: Leukocytes, 5,622; red cells, 1,340,000; Hgb., 25 per cent.

The patient had gained considerably in strength, despite the fact that the blood examination was not materially changed during his stay in the hospital.

The improvement in the function of urination seemed to relieve the patient of most of his symptoms except weakness, and he desired to be discharged from the hospital.

The cystoscopic examination at this time, six weeks following operation, was as follows:

*Cystoscopic Examination.*—The bladder was entered with a soft rubber catheter, No. 18 Fr. The residual urine was 3 ounces; urine nearly clear; bladder washed clean in two minutes; bladder capacity, 400 cc.; 320 cc. of sterile water as examining medium. A simple, concave, indirect cystoscope passed without difficulty into the prostatic urethra, through which it passed with a deviation of about 10 degrees to the patient's left. The bladder rugæ distinct, but small, partially perhaps because of the large degree of distension by the examining fluid. The bladder wall was slightly injected everywhere; trigone distinct and but slightly injected. Both uretral orifices normal in appearance. The urine ejaculated clear. The vesical surface of the prostate as in Fig. 2. The right lobe, the one which was incised, shows a concavity which is rounded in outline throughout nearly its whole antero-posterior diameter. The limit of the convexity on the vesical surface is visible, showing that more tissue has been destroyed in the middle of the lobe, and that the destruction has not quite extended to the peripheral edge of the lobe.

*Bimanual examination* with the cystoscope in the bladder and the finger in the rectum showed the tissue posterior to the urethra to remain about 1.5 cm. and the left lobe to remain about 2 cm., but the latter is more prominent than the right lobe, which is less than 2 cm. on its vesical surface. The elevation which was present on the right lobe at the previous examination is absent, the cystoscope not being drawn in during its rotation. The left lobe, by rectum, is larger than the right. The right lobe, however, still remains the harder. There is no induration and the surfaces are smooth. The median raphe is still slightly convex to the left.

*After Discharge from the Hospital.*—On September 1, 1903,

three months after the patient's discharge from the hospital, an examination of the bladder showed a residual urine of but 3 dr. The patient passed his urine but once during the night, and held it for from three to five hours during the daytime. There was no pain, and no difficulty in starting the urine, which came in a fair stream and which had more projection than at any time since he had been under observation. There was practically no

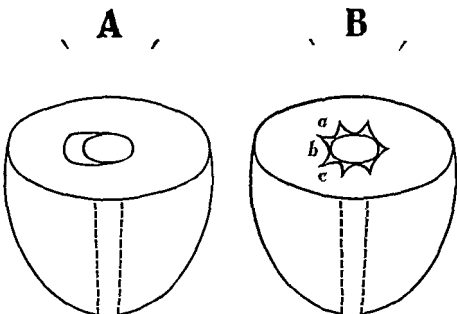


FIG 2A—Diagrammatic record of the cystoscopic fields at the vesical outlet showing three deep convex fields *a b c* in the right lobe.

B—The actual shape of the vesical outlet determined by transposing the cystoscopic pictures recorded in A showing the enlarged vesical outlet produced by sloughing away of the tissue about the incision (Compare with photograph of the specimen)

dribbling. The anæmia was much improved. The white cells were 6500, red cells 3500000, hæmoglobin, 45 per cent.

In November, 1903 the patient was readmitted to the Boston City Hospital on the service of Dr. John L. Ames, because of a return of the anæmia and its associated symptoms. I wish here to express my thanks to Dr. Ames for placing the record at my disposal.

*Blood Examination*—Leukocytes, 8000, red cells, 912,000, Hgb, 25 per cent, achromia and poikilocytosis marked. Differential count: Neutrophils, 67.6, basophils small, 22.5,



basophiles, large 5.3; eosinophiles, 4.6; no normoblasts or megablasts.

The patient had been growing weak for about ten days, and during this time had noticed an increasing difficulty in performing the act of urination.

A large soft rubber catheter was passed into the bladder without difficulty, and 12 ounces of residual urine was withdrawn.

The ease with which the catheter was passed showed that the prostatic urethra was of fairly large calibre.

*Urine Examination.*—Pale; slightly acid; slight trace of albumin; sp. gr. 1010; small amount of sediment consisting of a small amount normal blood; some pus; a few hyalin casts, with blood and renal cells adherent; occasional brown granular casts; much squamous and round cells epithelium.

The residual urine constantly increased in amount with the progression of the anæmia, and six weeks later the right kidney could be felt when the bladder was full but not so when empty. The residual urine had reached 36 ounces, and the twenty-four-hour amount ranged between 85 and 100 ounces. The anæmia at this time was most pronounced.

*Blood Examination.*—Leukocytes, 8,800; red cells, 656,000. Differential count: Polymorphonuclears, 73 per cent.; basophiles (small), 6 per cent.; basophiles (large), 18.5 per cent.; eosinophiles, .5 per cent.; transitional, .1 per cent.; two megaloblasts and one normoblast.

*Urine Examination.*—Pale; neutral; sp. gr., 1.008; slight trace of albumin. Considerable sediment, consisting of pus, normal blood, some small round cells and squamous epithelium; some neck of bladder cells; no casts.

As the anæmia began to improve the patient experienced less difficulty in the act of urination, and after a stay of three months in the hospital the anæmia had greatly improved and its symptoms were absent. The residual urine at this time had dropped to 10 ounces.

*Blood Examination.*—Leukocytes, 11,300; red cells, 2,928,000. Differential count: Polymorphonuclears, 71.2 per cent; large mononuclears, 6.2 per cent.; small mononuclears, 17.3 per cent.; eosinophiles, 4.5 per cent. Eight mast cells and no blasts.

During the next month the anæmia continued to improve, and the residual urine dropped to five ounces.

There was again a remission of the anæmia and the residual urine gradually increased in amount as the general weakness progressed

He was admitted to the Long Island Hospital April, 1904

The general physical examination was as noted at the City Hospital The blood examination at this time was Leukocytes, 6400, red cells, 472,000, Hgb, 10 per cent, some poikilotytosis and achromia Differential count Basophiles, 32 per cent, neutrophiles, 68 per cent No eosinophiles or blasts

The bladder was overflowing constantly and an effort to urinate resulted in the passage of only a few drachms There was no obstruction to the passage of a No 18 Fr soft rubber catheter

*Urine Analysis*—Pale, acid, sp gr 1014, slightest possible trace of albumin, no bile or sugar Considerable sediment, consisting mostly of pus Occasional calcium oxylate crystals and a few small and large epithelial cells

This attack of anæmia was not so pronounced nor did it persist as long as his previous attacks, and six weeks after his admission to the Long Island Hospital the red cells had increased to 1 616,000, there was only slight achromia, one megaloblast and no normablasts, and the Hgb had risen to 30 per cent At this time the bladder emptied itself except for two drachms Micturation occurred every two hours during the day and but twice at night The stream was a little slow in starting, came in fair volume with but little projection and there was slight dribbling after the act

*Urine Examination*—Normal color, normally acid, sp gr 1011, slightest possible trace of albumin Small amount of sediment, chiefly pus, with occasional squamous epithelial cells

The patient continued to gain in strength, and in July, 1904, he was out daily and able to do light work The Hgb at this time was 75 per cent The bladder emptied itself except for three drachms Urination occurred every four hours during the day and once or twice during the night The stream started without difficulty, was of good volume, and had fair projection A No 20 Fr soft rubber catheter could be passed into the bladder without difficulty The urine was normal in color with but little sediment

The patient's general condition remained good, and in Jan

uary, 1905, bladder symptoms were absent and the residual urine was but three drachms. The blood examination at this time showed red cells, 2,960,000; Hgb. 45 per cent. Differential count: Neutrophiles, 81 per cent.; basophiles, 18 per cent.; eosinophiles, 1 per cent. One normoblast and three megaloblasts.

In May, 1905, bladder symptoms were absent and there was a residual urine of two drachms. The patient's general condition was good and he was discharged from the hospital.

The patient did light work and remained in fairly good general health for four months. He was readmitted to the Long Island Hospital in August, 1905, on account of a remission of the anæmia and its accompanying symptoms. The patient had lost much in general condition and had complete retention of urine.

This attack of anæmia was pronounced in severity and his general condition remained poor, and the bladder had to be emptied regularly by the catheter for nearly four months. The red corpuscles dropped as low as 1,408,000 and the Hgb. to 15 per cent. The urine became very turbid, the albumin increased, and there was much sediment, consisting of pus, squamous epithelium, casts and renal elements.

About four months after readmission to the hospital there was a gradual improvement in the patient's general condition and the red cells reached as high as 2,400,000 and the Hgb. 50 per cent. At this time the bladder emptied itself except for one ounce.

This improvement was of short duration, the anæmia returned and the patient became very weak. There was complete retention of urine.

*Blood Examination.*—Red cells, 1,004,000; Hgb., 20 per cent.; marked achromia and poikilocytosis. Differential count: Basophiles, 30 per cent.; neutrophiles, 67 per cent.; eosinophiles, 3 per cent.

The patient failed rapidly from this time on, became uræmic, and died one week later.

Following is the autopsy report of the urinary tract, made by Dr. S. B. Walbach, pathologist at the hospital, and also a photograph of the specimen (Fig. 3):

*Kidneys.*—Both kidneys tightly adherent to surrounding fat and muscle tissue. The left kidney is apparently one-third smaller than the other. Both are soft, lobulated, fluctuant. On section both are found

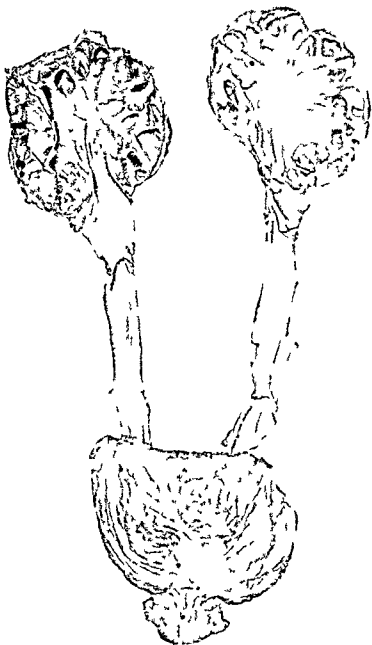


FIG. 3.—Note the crescentic area outlined by dots at the right of the apex of the trigonum extending into the prostatic urethra to the right of the verum montanum which is the area of incision of the Bottin operation. Note that the urethra on this side of the verum montanum is greater than on the left and that the prostatic urethra is unobstructed throughout. Note the thickening of the bladder wall and pronounced surface markings. Note the dilatation of the ureters etc. dilated pelvises and calyces, and the small amount of renal parenchyma.



to consist of a series of peripherally arranged cavities 0.5 to 2 cm. in diameter, communicated with enormously dilated pelves. The surrounding parenchyma is very thin, averaging 1 to 3 mm. thick. The pyramids are atrophied and not demonstrable except in the lower pole of the right kidney, where the cavities are smaller. The capsules are much thickened, dense, white, about 0.5 mm. thick, and cannot be separated from the kidney. Both kidneys contain thin greenish yellow puriform material. The lining of the pelvis in places is thick, and injected, giving a velvety appearance.

*Ureters*—Both are greatly dilated with much thickened walls. Circumference ranged from 3 to 4 cm. Both show ballooning just before entrance into the bladder. The left ureter leaves the pelvis of the kidney by a tortuous, S shaped route. Ten cm. above the bladder orifice there is an obliquely placed constricting ridge projecting into the lumen reducing the circumference at this point to 2 cm. The right ureter, 20 cm. above the bladder orifice, on posterior wall has a diverticulum running upwards for 2 cm. This recess has about the same calibre as the main lumen of the ureter, which is constricted here to about 2 cm. The wall between the ureter and recess is thick and on section appears as if formed from the fusion of the walls of adjacent limbs of a loop.

*Bladder*—Contracted. Contains about 60 cc. of greenish yellow puriform material with abundant coagula. Walls are thick, trabeculated. Mucous membrane is folded injected, velvety. Some greenish discoloration. Orifices of ureters are prominent and allow easy passage of probes. To the right of the apex of the trigonum is a crescentic cicatrix extending into the urethra.

*Prostate*—Not large, rather flabby, prostatic urethra is large, lined with scar tissue continuous with cicatrix and bladder. The verum montanum is pushed to the left, and there are two parallel folds of mucous membrane running from it to the apex of the trigonum. The channel to the right of the verum montanum, that which is lined with smooth dense white tissue, is 3 cm. long. Below this the urethra is normal.

### REMARKS

The feature of this case which it is desirable to emphasize is the five repeated attacks of intermittent urinary retention associated with the relapses of the anæmia. Concurrent with the changes in the blood and weakness of the general muscular system the bladder wall has lost its contractile power and retention of urine has resulted. As the anæmia has improved and the muscle system has regained its tone the bladder symptoms have diminished and have even been absent. The retention has gradually improved with the patient's general strength.

and between the anæmic attacks the bladder has been able to empty itself, except for a drachm or two.

Of course the changes in the upper urinary tract—the hypertrophy of the bladder wall, the dilatation of the uterus, kidney pelvices and calices, and the infection and destruction of the kidney tissue dependent upon the prolonged intermittent intravesical pressure—have still remained.

The case also illustrates the value of the Bottini operation in affording relief to prostatic obstruction by incising the obstructing portion of the gland in a class of cases which will not stand general anæsthesia or the shock and convalescence attending prostatectomy.

That the Bottini operation was of benefit in overcoming the obstruction in the prostate and that these changes in the upper urinary tract were not due to an obstruction to the out-flow of the urine is evident from the fact that between the anæmic attacks the patient was able to start his urine easily, that it flowed freely in fair volume and that the bladder was emptied of its contents except for one or two drams.

The post-mortem specimen shows a patent prostatic urethra at the site of the operation, and demonstrates that the new channel made by the Bottini incision has not become, nor shows any tendency towards becoming obliterated during the three years time.

# ARTHROPLASTY UPON THE ELBOW JOINT

BY CHARLES L. SCUDDER, M.D.,

OF BOSTON, MASS

Surgeon to the Massachusetts General Hospital

THE following case illustrates the result of a plastic upon an ankylosed elbow joint one year and four months after the operation

The patient was an adult man, 48 years old, a farmer and a carpenter by occupation

The right olecranon was fractured by a fall from a wagon, April 21, 1905. There was at the time very great swelling about the elbow and considerable displacement forward of the shaft of the ulna. The arm was extended, and covered with wet compresses for eight days. On April 29 the joint was opened through a posterior incision by the attending physician. Three fragments of bone were removed from the joint. An attempt was then made to wire the remaining fragment of the olecranon to the shaft of the ulna. Primary union followed in the superficial parts. The arm was immobilized for two weeks, and then gentle motion was begun. A few days later crepitus was noticed in the region of the fracture. A radiograph was taken, which disclosed a broken wire and the separation of the fragment of the olecranon from the ulnar shaft.

At this time the patient first came under my observation, July 6, 1905.

The elbow joint was almost completely ankylosed at an obtuse angle. There was a little movement possible, both actively and passively at the elbow joint, about 5 degrees.

In July, 1905 I did an arthroplasty upon the elbow joint by the following technique

Steps in the operation of arthroplasty. Exposure of the joint by section of the olecranon, preparation of the joint and bony surfaces, making the fascial fat flap, placing of the flap, suture of the olecranon fragment, closure of the joint, immobilization



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A long posterior incision was made, dividing all structures to the fascia, excepting that at that part of the incision over the back of the upper arm only the subcutaneous fat tissue was exposed. The olecranon was separated from the shaft of the ulna at the original point of fracture. Sharp flexion of the elbow exposed the joint surfaces, whereupon all adventitious bony and periosteal tissue was removed. The synovial membrane of the joint was thoroughly excised, a small bit of bone from the tip of the coronoid process was removed, and the ends of the bones were thoroughly freed.

The skin over the back of the upper arm was reflected laterally the whole length of the incision. A rectangular flap was then taken from the posterior surface of the upper arm, about three inches wide and five or six inches long, which included the fascia of the upper arm together with a small amount of subcutaneous fat tissue left when reflecting the skin flaps in the primary incision. When this flap was reflected the muscles of the back of the forearm were completely exposed. The pedicle of this flap was attached just above the posterior surface of the elbow joint.

The flap was rotated and swung into the joint, and placed between the ends of the exposed bones. The flap covered the lower end of the humerus, and the sigmoid cavity of the ulna and the upper end of the radius. The flap was held in position by a few interrupted sutures to the farther side of the joint.

The olecranon fracture was sutured by aluminum bronze wire. The fascia and ligaments about the joint were approximated so as to completely close the joint. The subcutaneous tissues were closed by interrupted sutures. The skin was sutured with silk worm gut. The wound was not drained. The arm was fixed at a right angle by an internal angular splint. Gentle passive motion was given at the end of about ten days.

At the present time, one year and four months following the operation, the man has a strong and useful arm, with which he is able to do all the work about a small farm.

The amount of movement at the elbow joint is seen in the accompanying photographs. Figs. 1 and 2 show the amount of motion three months following the operation. Figs. 3 and 4 show the amount of movement at the present time, one year and four months after the arthroplasty. In Figs. 3 and 4 is also illus-



FIG 1 —Voluntary extens on three months after operat on



FIG. 2.—Arthroplasty. Voluntary flexion three months after operation.



FIG 3—Arthroplasty Voluntary flexion one year four months after operation Note flexion of fingers



FIG. 4—Arthroplasty. Voluntary extension one year four months after operation. Note extension of fingers.

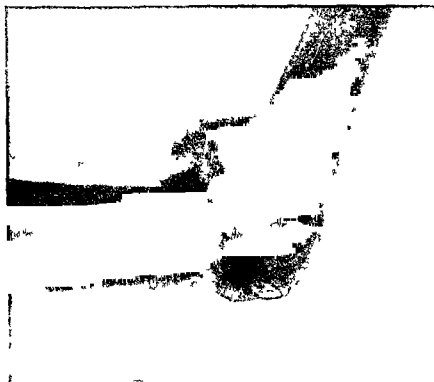


FIG. 5—Arthroplasty. X-ray taken one year after operation. Note the line of section of olecranon to render easy access to joint. Note clear space corresponding to new elbow joint. Olecranon is solidly united to shaft of ulna.





trated the amount of flexion and extension of the fingers. Slight pronation and supination are possible.

The elbow does not trouble the man excepting for the small amount of limitation of motion. He has no pain and no discomfort with the joint locally that is of any importance. During wet weather there is a little feeling of discomfort about the joint, which he attributes to "rheumatism."

Fig 5 shows the conditions as determined by the X-ray taken one year after operation. The olecranon process has united firmly to the shaft of the ulna by bony union, the wire is seen in place. It is broken at one point. The clear space of the joint is to be especially noted.

X ray pictures taken previously to this one were not suitable for reproduction, but compared with this plate it is certain that there is no new formation of bone going on about the joint. The possible motion in the joint has not diminished since the first. Therefore it is reasonable to suppose that we have to day in this case the final functional result of the operation.

There are certain facts of interest in connection with this operation of arthroplasty upon the elbow joint.

An ample incision greatly facilitates the operation. By section of the olecranon the exposure of the joint is easy, and the insertion of the triceps tendon is preserved intact. Consequently, after operation extension of the forearm is possible. The normal strength of extension is also maintained.

In the usual operation by a median posterior incision for complete excision of the elbow joint the power of extension is lost, or at most is very weak.

It is important, as Murphy of Chicago has pointed out, to clear the joint thoroughly of all adventitious tissue, as well as of any synovial membrane remaining. In a joint opened by the above method in which the wound is closed by layer suture, there is no abnormal lateral mobility, no wobbling.

Murphy has found that the leaving of a thin layer of fat tissue attached to the fascia, to be used for the flap, is advantageous in the formation of a new joint.

The temporo maxillary joint, the elbow joint, and the hip

joint are best suited to this form of plastic surgery. This procedure is best avoided in elderly individuals. It is adapted to the joints of children and young adults.

Persistence in passive and active movements after operation is essential to securing the greatest possible motion in a new joint formed by arthroplasty.

# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, November 28, 1906*

The President, DR GEORGE WOOLSEY, in the Chair

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### CONGENITAL LUMBAR HERNIA THROUGH THE TRIANGLE OF PETIT

DR CHARLES N DOWD read a paper with the above title, for which see page 245

DR JOHN F ERDMANN said that about four years ago he saw two cases of congenital lumbar hernia, both on the left side, and both quite typical. The first patient, a child of two years, was lost sight of. The second, a child of four years, was operated on by Dr Erdmann. The hernial protrusion was through the triangle of Petit, and no difficulty was encountered in closing the defect by bringing together the latissimus dorsi and the external oblique muscles.

### CYSTS OF THE SUPRARENAL BODIES

DR ANDREW J MCCOSH read a paper with the above title

DR CHARLES H PECK said the possible extension of these suprarenal cysts upwards, and their pressure against the wall of the diaphragm, to which Dr McCosh had referred in his paper, recalled a case which came under his observation last summer. In that instance there was an extremely large cyst, filling the upper left quadrant of the abdomen. It was firmly adherent to the surrounding structures, and while the supposition at the time of operating was that it sprang from the pancreas, it might have had its origin in the left suprarenal, although its surface did not present the orange colored spots which Dr McCosh men-

tioned as indicative of suprarenal cysts. An attempt to enucleate the cysts was abandoned when it was found that it had invaded the right thoracic cavity, passing beneath the ligamentum arcuatum internum. The entire hand, with the exception of the thumb, could be inserted into the opening beneath this ligament into the thoracic cavity, barely reaching the upper limit of the cyst, which compressed the lung and parietal pleura.

The cyst was emptied and drained, the patient made a good recovery from the operation and was well the last time Dr. Peck saw her.

#### ADVANTAGE OF THE LATERAL POSITION IN CERTAIN OPERATIVE PROCEDURES.

DR. F. TILDEN BROWN demonstrated a folding-board which he had found very useful for the purpose of obtaining a satisfactory exposure of the iliocostal space in operations on the kidney and prostate with the patient in the lateral position. He also emphasized the importance of relieving the patient's chest from the pressure of the overlying arm during narcosis, and showed an upright upon which the arm could be suspended.

DR. F. KAMMERER said he also had found the lateral position of great advantage in difficult nephrectomies. To prevent turning over on the abdomen or on the back the speaker usually had the pelvis of the patient firmly held by a nurse seated at the lower end of the operating table. Of course the sound side had to be supported by some firm pillows or some device similar to the one shown by Dr. Brown. Speaking of position Dr. Kammerer said that he had had a rather disagreeable experience last spring with a patient on her abdomen over the customary inflated rubber pillow, Dr. Thos. L. Bennett administering the anæsthetic. The operation of nephrectomy had been underway for about 10 minutes when the pulse rather suddenly became weak and rapid, going as high as 180 a minute. The condition of the patient became critical and, at Dr. Bennett's suggestion, the position was changed to the lateral and the pillow removed. The condition immediately improved and the pulse in several minutes dropped to 120.

# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting held November 5 1906*

The President, DR JOHN B ROBERTS, in the Chair

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### LAMINECTOMY FOR TUBERCULOSIS OF THE SPINE

DR JAMES K YOUNG presented a girl, 14 years of age, who, on February 7, 1902, fell on the ice, striking the dorsal region against a step. Two months later, she was sent by her attending physician to the Orthopædic Hospital and a brace was applied. In the spring of 1903 she was admitted to the University Hospital for beginning loss of power in the lower limbs. Subsequently she was admitted to St Joseph's Hospital and to the Polyclinic Hospital. In January, 1906, she was admitted to St Joseph's Hospital under his care, and he performed a laminectomy the day following her admission. Throughout all this time from the date of the accident to the time of operation her condition had progressed steadily worse, with slight intervals of improvement. The 8th, 9th, and 10th vertebræ were involved, there was a marked kyphosis, and paraplegia came on early and was intermittent, but steadily growing increasingly worse. Fourteen months before the operation her limbs became spastic and she had exaggerated knee jerks, marked ankleclonus, and Babinsky reflexes on both sides, with at times crossed reflexes. There was still some motor power. The following month, November, 1904, she could walk around the bed holding on for support, but rather awkwardly. One week later she could walk alone, and there was great improvement.

She again relapsed after this, and in April, 1905, upon her admission to the Polyclinic Hospital, she was completely paralyzed

and there was slight incontinence. In July, 1905, there was complete motor paralysis with slight incontinence which increased until at the time of the operation there was complete incontinence and complete motor and sensory paralysis.

On January 19, 1906, an incision five inches long was made from the third to the eleventh vertebra, the spinous processes of the ninth and tenth vertebræ were removed, and the lamina of the ninth vertebra was removed. An abscess was found beneath this on the right side which was opened and drained. A catgut drain was inserted and the wound closed, except for the drainage.

On February 26 the sensation in the lower extremities was slightly delayed but was present on both sides, and slightly hyperæsthetic. The patellar reflexes were exaggerated, ankleclonus was present on both sides, the left more marked, and Babinsky reflexes were present on both sides and were marked. There was some contraction of the right knee at this time. Thermal sensation was diminished.

She was treated with electricity and massage and sent to the seashore. The motor power has gradually improved, the abscess has closed, and she is now able to walk a short distance unassisted, and has regained perfect control of the bladder and rectum.

Dr. Young said that two points were illustrated by this case, first, the diagnosis of abscess by the intermission of symptoms, improvement and relapses; second, the possibility of recovery by means of the operation of laminectomy after complete loss of motion and sensation.

He did not share the ultra-conservative opinion expressed by some surgeons in regard to laminectomy, but believed that under certain conditions this operation is a justifiable one. For abscess pressing upon the cord and for early spastic contractions of the extremities he believed the operation should be performed earlier than is customary.

DR. HENRY R. WHARTON said the case reported by Dr. Young was eminently one for laminectomy, the presence of an abscess in the spinal canal showing that the patient's condition was hopeless without operation. Simple rest in some cases of Pott's disease results in restoration of motion and practical recovery, but in others laminectomy is the only alternative. The diagnosis of abscess is difficult; as pointed out by Dr. Young, intermissions in improvement are a valuable sign in this respect.



FIG 1 Double lower lip





DR. YOUNG, in closing, said the crossed Babinsky reflex was the unusual feature of the case. Usually this sign is present on one or both sides. Here it was present on both sides and irritation of one foot caused the reflex on the opposite side.

#### TRUE DOUBLE LOWER LIP

DR. JOHN B. ROBERTS presented a patient upon whom he had operated for the removal of a true second lower lip. The photograph (Fig. 1), taken before operation, showed the double lip to consist of a thick outer lip and a thinner internal structure separated from the outer by a deep fossa lined with mucous membrane. In the median line of the mouth the two lips were fused together at the vermilion border and downward to the attachment of the structure to the alveolar portion of the mandible. The inner lip was dissected from the outer and encised. The raw surface was then covered by drawing flaps of mucous membrane over it. The patient's curious anomaly was corrected and his appearance much improved.

#### EXCISION OF HALF OF THE LOWER JAW AND HALF OF THE TONGUE FOR EPITHELIOMA

DR. H. S. CARMANY exhibited, by invitation, a patient on whom he had operated one year previously for carcinoma of the tongue and jaw. The disease was of three months' duration, and extended from the under surface of the tongue to the alveolar process of the inferior maxilla on the right side, and from a little beyond the median line to the last molar tooth. It was painful and growing rapidly, and the cervical glands were enlarging on the same side. Dr. Carmany excised the lower jaw on the right side from just below the sigmoid notch to a point a little beyond the median line, and with it the right half of the tongue, the submaxillary gland and a few small cervical lymph glands. The wound healed kindly, and the man has remained in good health. Dr. Carmany asked the opinion of the Fellows as to the advisability of applying a dental splint in these cases.

DR. CHARLES F. NASSAU said that one should never operate on carcinoma of the lower lip, tongue or jaw without taking out the glands of the neck. Twelve years ago Dr. Nassau operated in this manner upon two patients and five years afterward both were still free from recurrence. In any extensive growth of the

jaw there is almost surely infection of the neighboring glands before they are palpable. Their removal is just as necessary as in connection with carcinoma in other portions of the body where the lymph channels are followed in the dissection. In Dr. Carmany's case life has undoubtedly thus been prolonged.

DR. CHARLES H. FRAZIER said, in response to Dr. Carmany's inquiry regarding the use of dental splints in connection with partial resections of the lower jaw, that it had been his habit in his clinic at the University Hospital, always to consult a dentist prior to the operation. Dr. Cryer or one of his assistants had always been kind enough to examine the case before the operation and construct a temporary splint, which was applied at the completion of the operation. A permanent splint in the meantime may be made and adjusted after the wound is healed. By adopting this method the disfigurement accompanying the removal of the lower jaw may be largely, if not altogether avoided.

DR. JOHN B. ROBERTS said that he had seen a case of this kind in which Dr. McBurney had a dental appliance made before operation. It was held in place by a spring and fitted so well there was almost no deformity of the part.

#### RUPTURE OF THE KIDNEY.

DR. MORRIS BOOTH MILLER, by invitation, reported the history of a man of 31, a special officer of the B. & O. Railroad, who while chasing thieves fell, striking on his left side over the lower rib. He walked a distance of fifty feet before feeling faint. He then passed by urethra what appeared to be at least a quart of blood and twenty minutes later a second quantity containing many clots. While on his way to the Polyclinic Hospital on a street car he was obliged to leave the car and again pass blood and urine. He walked into the hospital where six ounces of blood were withdrawn by catheter. Dr. Miller saw the man one and one-half hours later. There was no shock but the side was rigid and tender and an indistinct dull mass could be felt in the loin. An oblique lumbar incision was made. A mass the size of two fists was revealed and opened, showing extensive hæmorrhage and rupture of the kidney. The two poles were separated and the finger could be passed between numerous small fragments into which the middle segment of the organ had been divided. This caused severe bleeding. Wicks of gauze

were placed against the kidney in front and behind and by pressure the poles were brought approximately together. The patient did well hæmorrhage practically ceasing in five days though at two later periods blood appeared in the urine. The amount of urine passed was at first 22 ounces but soon rose to 30 and then to 40 ounces. On the seventh day the wound dressings showed the presence of urine which then leaked through the back for a period of two weeks the quantity being estimated at 20 ounces a day. On the twelfth day the packing was all removed and the opening finally healed. Suppuration was not present in the wound at any time. The temperature chart of the patient shows three rather sudden rises probably due to cystitis as the bladder was frequently washed.

DR HENRY R WHARTON stated as his personal experience that conservative surgery of an injured kidney is good surgery. He knows of several cases in which there were symptoms of ruptured kidney, including hæmorrhage from the urethra and a mass in the side and the majority recovered. Another class of cases is formed by those in which infection occurs and abscesses form in the loin or abdominal cavity. He has also seen several of this type in which urinary fistula followed opening of the abscesses but these sinuses all closed spontaneously.

DR CHARLES F NASSAU agreed with Dr Wharton that it is not always necessary to operate on a ruptured kidney, this accident is probably more frequent than generally alleged. One patient a woman, undoubtedly had a severe kidney injury, as shown by a mass in the loin and bloody urine for several days. She recovered. A second case was seen in the absence of a hospital colleague and would have been subjected to operation had he not been going to return soon. The colleague waited and did not operate for ten days. By that time the patient had bled so much he died when under operation. Some days ago a man was kicked in the back by a horse the injury being followed by hæmaturia with free blood in the abdominal cavity as clearly shown by physical signs. The pulse increased rapidly and the abdomen was opened. A rent in the liver four inches long was found but in addition there was blood behind the peritoneum and the kidney was found torn in half and absolutely loose from all surrounding structures. The kidney was removed and the man did well. He passed 35 ounces of urine on the third day.

He then developed pneumonia and died in two days. If in cases of kidney injury hæmorrhage continues and other conditions do not prevent it, an incision into the loin is indicated. This has not even the danger of an abdominal section and will at least get rid of a hæmatoma which might otherwise become infected.

DR. JOHN B. ROBERTS described the case of a boy of 10 or 12 who was run over by a wagon, the wheel passing over his abdomen. He was brought to the Polyclinic Hospital where nothing definite regarding his condition could be determined. There was pain in the abdomen as though due to local peritonitis but the abdomen was not opened. In two weeks all symptoms had disappeared and the boy was discharged. Two or three weeks afterward he came in with an enormous bulging mass in the right side which was dull and tender. An incision gave vent to limpid fluid and it was supposed that there had been rupture of a ureter or that a traumatic hydronephrosis had been tapped. Examination of the fluid led to the report by the pathologist that it was from a cyst of the pancreas. This appeared to the operator to be unlikely. Later the fluid that came from the drainage tube was examined and reported to be urine. Dr. Roberts does not know whether the fluid first obtained actually came from the pancreas and the later drainage from the urinary tract or not; but the boy recovered and is now perfectly well.

DR. FRANCIS T. STEWART regards the time before operation as the proper time for conservatism. If operation be necessary, radical procedure is then probably the best, as often the kidney will be found badly injured and had better be removed, although, of course, one must be guided by the conditions found. The dangers are hæmorrhage and sepsis. The two early indications for operation are a progressively increasing hæmatoma and constitutional symptoms of hæmorrhage. Usually these two go together. Sepsis is at times a later indication. Hæmaturia is not necessarily an indication for operation. His chief difficulty has been to make a correct diagnosis. In one case, that of a man injured by a crush, a large amount of blood was passed by the urethra, the abdomen was rigid and there was marked shock. Rupture of the bladder was suspected by Dr. Gibbon who also saw the case and Dr. Stewart believed the condition to be a rupture of the kidney. Incision revealed intact kidneys and bladder and a ruptured liver. In this case, although the man

died of hæmorrhage from the liver, the pulse never rose above 100 though it was very weak. In another case secondary hæmorrhage after an abdominal operation, a large quantity of blood was passed by the urethra though there had been no injury of the bladder, ureter, or kidney. A third case was that of a boy who had been kicked in the abdomen. The symptoms were those of an intraperitoneal lesion and no blood was found in the urine. Operation revealed no injury to the abdominal viscera but a ruptured kidney. The kidney was removed and the case terminated satisfactorily. In several cases of moderate bleeding he has operated and afterward been sorry that he had interfered.

DR JOHN H GIBBON said he saw the man referred to by Dr Stewart and because of blood passed by the urethra regarded the case as one of probable rupture of the bladder. He agrees with Dr Stewart as to conservatism in cases of injury of the kidney when hæmorrhage is not sufficiently severe to cause death. He does not agree with the statement that hæmorrhage severe enough to demand operation usually means an injury sufficiently extensive to require nephrectomy. The question of nephrectomy must be decided when the kidney is exposed. If the rupture extends into the pelvis of the organ and implicates large vessels the kidney should be removed. He has seen cases in which one third of the kidney was separated from the remainder of the organ by blood clot terminate in good recovery after removal of the clot and insertion of packing. If suppuration does not occur in such cases one has a right to believe that function of the kidney has been restored. Removal of a kidney is so easily done that some are removed when nephrectomy is not demanded, this is also true of the spleen. Dr Gibbon believes that a kidney which shows numerous lacerations as did the one in Dr Miller's case is easier to save than is one containing a single large rent. A good working rule in rupture of the kidney is that if the bleeding can be controlled the kidney should not be removed.

DR MILLER in closing, said the justification for immediate operation in the case reported was the hæmorrhage. Often in these cases if the surgeon waits he loses the favorable moment for operation. Dr Miller agrees with Dr Gibbon that only when the kidney is exposed can the surgeon determine what is the wisest procedure. In his case he decided that barring anuria or later suppuration the man might get well with a functioning

kidney. It is to be remembered in deciding these cases that the patient has only two kidneys and if one be removed, loss of the other means death. So far as nephrectomy is concerned, the ruptured kidney in his case could have been removed with probably only slightly increased risk to the patient.

#### SARCOMA ORIGINATING IN THE ISCHIO-RECTAL FOSSA.

DR. GEO. ERETY SHOEMAKER said that sarcomatous growths may be found at widely distributed points in the body, as they may occur wherever there is a connective tissue. It is, however, unusual to find them situated in the ischio-rectal fossa. Sarcomata are from time to time reported in the pelvis, behind the peritoneum, involving uterus or ovary, intestine, sacrum or one of the iliac bones in the pelvic basin, but such cursory search of indices and such inquiry among surgeons as he had been able to make would indicate that the perineal or ischio-rectal region is a most unusual location for this form of tumor.

In a series of 54 cases of osteosarcoma of bones of the pelvis, collected by Havage\*, there were none springing from the ischium or pubis and none in the ischio-rectal region. He now reported a case in which its early stage the differential diagnosis was difficult in comparison with a low grade of connective tissue inflammation. Careful observation, however, showed a continuous growth, a complete absence of tenderness, a discreet form, no tendency to involve the rectal wall and no tendency to point externally. On extirpation of the mass it proved to be a mixed type of sarcoma, with a small central area breaking down. The case was as follows:

A well developed, strong and vigorous girl of 21, a student in typical health, resident of Kansas. Family history negative, weight 118; tuberculosis in a maternal uncle and in a grandmother. Menstruation regular and normal, no history of injury of the part. One month before being referred by her physician a lump about the size of a walnut was noticed deep in the left perineum; aching, but with neither pain, tenderness nor throbbing. No history of discharge and none of constipation. Had been unusually well for a year. Examination showed superficially to the left of the rectum and vagina and behind a line drawn

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\*Tumors of the Pelvis. 1882.



FIG. 2.—Sarcoma of ischio-rectal fossa. Two-thirds normal size. Age 21.





from the posterior vaginal commissure to the tuberosity of the ischium extending from the rectal wall out nearly to the ramus of the pubis and nearly to the tuber ischii a mass three inches from front to back two inches from right to left against the rectal wall but not infiltrating it firm somewhat movable No softening no redness The condition resembled a low grade of inflammation in the pararectal tissues but was too firm As a definite increase in size occurred with a tendency to greater fixation the diagnosis of tumor was made (Fig 2)

An antero posterior incision over the prominence was made  $1\frac{1}{4}$  inches to the left of the median line immediately opposite the center of the perineum There was no true capsule and no sharply defined line between normal and new tissue Small areas of hardening projected from the growth anteriorly toward the vulva At no point was the skin or mucous membrane involved One or two small tortuous subcutaneous veins were visible The growth invaded all tissue up to the rectal and vaginal walls and between them and the tuber ischii including muscle and fat Half an inch behind the edge of the ischium it appeared to be firmly attached The fingers were used to enucleate the mass and by blunt dissection it was separated from the pubis and ischium It did not appear to infiltrate or expose bone A superficial portion of the sphincter ani was preserved and only the superficial portions of the left labium majus The constrictor vagina on the left side was sacrificed and the erector clitoridis cut in two Hæmorrhage was not severe The trunk of the internal pubic was caught behind the tuber ischii giving a comparatively dry field The tumor removed was three inches in antero posterior diameter  $2\frac{1}{2}$  inches in lateral diameter and 2 inches from without inward The deeper parts of the wound were partly drawn together with catgut and the skin united except at the center where gauze drainage was applied There was no secondary hæmorrhage Marked œdema of the anterior portion of the genitalia developed making catheterization very difficult Union appeared at the end of the first week except at the point of drainage There was no lack of control of the sphincter ani but complete anæsthesia of the rectum and vagina on one side from division of nerves The rectum did not slough

Microscopical examination of the growth in the Laboratory of the Presbyterian Hospital showed sarcoma of mixed type

Although every vestige of visible or tangible disease was removed at the operation, recurrence was rapid locally and generally. The vulva and perineum of the left side were first invaded, the inguinal glands later. At the end of six months a mediastinal pressure is interfering with respiration and death is reported as imminent. Trypsin treatment has been used by her Kansas physician without benefit.

DR. CHARLES F. NASSAU cited a case seen three years ago which was similar to that of Dr. Shoemaker's, even to rapid recurrence and death. The patient was a young man sent to the hospital with the diagnosis of ischiorectal abscess. Suspecting malignancy, Dr. Nassau cut very wide of the lesion, taking everything to the tuberosity of the ischium. The tumor recurred in three months.

#### EXTREMELY VICIOUS UNION OF A FEMORAL FRACTURE SUCCESSFULLY TREATED BY OSTEOTOMY, NAIL- ING AND VERTICAL TRACTION.

DR. JOHN B. ROBERTS showed skiagraphs of this case to illustrate, (1) an unusual displacement as the result of a fracture; (2) the result gained by the use of nails and traction, and (3) the unreliability of the X-rays. The patient was a child of three years who was thrown down in a field by a calf winding him in the coils of a rope. He was seen by Dr. Roberts at the end of eleven weeks, when the leg showed five inches shortening. Operation by Dr. Roberts showed that the femur had been fractured, the fragments crossing and also being twisted. There was solid union and great force was required to chisel apart the fragments. Contraction of the muscles could not be entirely overcome by pulling. The fragments were adjusted, but still overlapped; to prevent twisting again taking place, two fracture nails were driven into them; and horizontal traction applied by the ordinary method. At the end of a week the nails were withdrawn, the leg put in the vertical position and a weight applied to stretch the muscles. The leg is now straight, there is solid union and careful measurement shows a shortening of about one and one-half inches. The skiagraph taken shows what appears to be an overlapping of three inches. The Crookes tube was probably not carefully placed over the fracture when the exposure was made. The medical profession should now deprecate too great reliance on the

X rays Skiagraphs, taken as they usually are by a man who is not a surgeon and who does not know the case, are apt to lead to erroneous deductions They may lead us into errors and should not be relied upon as much as people usually think

DR GEORGE G ROSS agreed with Dr Roberts as to the danger of the X-rays in fracture work, the picture is correct, but the interpretation is wrong As corroboration of clinical diagnoses he has used many skiagraphs He advises against having skiagraphs of results taken, as there may clinically and functionally be a satisfactory termination and yet the X rays shows an amazing condition

DR ROBERTS replying to a question as to how much was gained by traction upon the leg after removal of the nails, said that the nails were put in to prevent twisting, not overlapping, as he was afraid the original twist would recur The nails were a temporary expedient to maintain apposition of the raw bone surfaces As he thought that five days were sufficient to prevent twisting, the leg was then placed in the vertical position and traction with a weight and pulley applied He does not know exactly how much was gained by this expedient but he felt that the operation had reduced the shortening from five to three inches As the leg now is only one and one half inches shorter than its fellow, he believes that he gained about three and one-half inches by the operation There is, of course, the possibility that the legs were of unequal length before the fracture occurred

#### BULLET WOUND PIERCING LUNG DIAPHRAGM AND THE SPLEEN

DR R P McREYNOLDS said gunshot wounds which penetrate the lungs, the diaphragm and some one or more of the abdominal viscera are not unusual but they are perhaps rare enough to justify the report of the following case which was seen in a private house in consultation with the attending physician, Dr M Graham Tull A sixteen-year old boy attempted to shoot himself through the heart, but his knowledge of anatomy was not accurate and he missed his aim The bullet entered the seventh interspace, mid nipple line, ranged downward, passed through the diaphragm and came out posterior between the eleventh and twelfth ribs mid scapular line

DR McREYNOLDS saw him within an hour of the accident,

he had some dyspnoea, and some pain, but on the whole his general condition was good; he was but little shocked and the external hæmorrhage had been insignificant. But from the range of the bullet, the rigidity of the abdominal muscles and a marked increase in the leukocytes an immediate operation was advised. He was hurried to the Presbyterian Hospital and under general anæsthesia the abdomen was opened high up through the left rectus muscle. The spleen was found to have been almost bisected by the bullet and was bleeding freely; none of the other abdominal organs were injured. An attempt to suture the wound in the spleen was made but failed and resort was had to tamponnage—the gauze being placed so as to approximate the edges of the wound and to stop the hæmorrhage. The usual after-treatment for such cases was instituted and wound healed by granulation.

From the thoracic wound a septic pneumonia developed from which a long and severe illness followed. However, he finally made a good recovery and now, two years after the injury, is strong and healthy.

Remarking upon this case Dr. McReynolds said that there are no early physical pathognomonic signs of internal hæmorrhage; prompt surgical action will however establish the diagnosis, and in the majority of cases give the patient the best chance for his life. In abdominal injuries requiring laparotomy, the rule “when in doubt operate at once” seems to be a good one. Penetrating wounds of the lung give a high mortality and the treatment of such cases is not altogether satisfactory. Dr. Rodman, in an excellent monograph on this subject, has very aptly summed it up in two words—“masterly inactivity.” This is certainly the accepted treatment of all simple penetrating wounds of the thorax, such as usually occurs when the wound of entrance is above the sixth interspace. But if the wound is below this point and there is reason to believe the diaphragm has been punctured and the abdominal viscera injured, the modern tendency is towards masterly activity. Dr. Daniel H. Williams in an article published in the *ANNALS OF SURGERY*, November, 1904, advocates resection of a rib, suturing the rent in the diaphragm and following the wound to the end. The success in a number of cases so treated would seem to justify this procedure, especially in cases where there is no wound of exit and therefore an uncertainty about the injury to the abdominal viscera.

Statistics show that gunshot wounds of the spleen have been most always fatal the majority of the cases dying from hæmorrhage and generally within twenty four hours. In dealing with a splenic wound there may be a choice of several procedures: *i. e.* Suturing with catgut and reenforcing by sewing the omentum over it. Tamponnage with strips of gauze. Splenectomy. Cauterization. The first two are the methods of election. It would seem that the ideal procedure would be to close the wound with catgut sutures and then reinforce by sewing the omentum over it.

The spleen was first sutured by Lamarchia in 1896 his patient promptly died from hæmorrhage (he did not sew the omentum over the wound). However others have been more successful—there are in this country two and probably more cases reported of successful splenorraphy. Treatment by tamponnage has given very good results. Berger in exhaustive statistics covering one hundred and twenty seven cases of splenic wounds from various causes treated by laparotomy records ten cases treated by tamponnage with only one death. Successful cases of ruptured spleen treated by this method have been reported by Gibbon, Brewster and others. Senn from extensive experiments upon dogs concludes that marginal compression of the wound by hæmostatic forceps should precede the introduction of the catgut sutures claiming that the compression diminishes the hæmorrhage and permits of the more easy and successful introduction of the sutures.

If the spleen has been so extensively injured that it cannot be sutured and tamponnage will not control the hæmorrhage a splenectomy is indicated but this materially adds to the danger. The kind of the operation performed is not of so much importance as the time when it is performed. He had seen two cases of rupture of the spleen and both lost their lives he thought because they were not operated on early enough.

#### PHANTOM URETERAL CALCULI

DR. FRANCIS T. STEWART exhibited X ray plates which were made from a patient in whom Dr. Dwyer suspected ureteral calculus because of pain radiating from the iliac regions to the loins and the passing of large numbers of uric acid crystals. No blood was found in the urine. The plate taken by Dr.

Manges, shows shadows which at first were thought to be those of ureteral calculi. There were five on the left and two on the right side, one being large as a pea. More careful examination of the plate raised the suspicion that the shadows were not those of ureteral calculi, as the five on one side were not in perfect alignment and were outside the course of the ureter. Further investigation was decided upon and the bladder was inspected and both ureters catheterized, the latter appearing free. Both vaginal and rectal palpation, however, showed between the vagina and rectum extremely hard, apparently calcareous masses, five on one side, and two on the other. They were not excised, hence their nature is unknown, but they were thought to be phleboliths. Cystoscopy showed that the orifice of the right ureter was in the middle line and that of the left further to the side than normal, so the situation of shadows out of the usual line might in some cases be regarded as due to calculi in the ureter.

The diagnosis of ureteral calculi by the X-rays is not absolutely positive, whether shadows are or are not shown. In one case ureteral colic was felt on one side, but two X-ray plates proved negative. As there was a little blood in the urine and colic persisted it was concluded that the X-rays were wrong. Catheterization of the ureter showed no obstruction, but as no urine came through the catheter for ten hours salt solution was injected. Aspiration then brought away many uric acid crystals which may have caused the obstruction. Dr. DaCosta has reported a case of calcareous lymphatic gland supposed to be a ureteral calculus. He operated in this case upon a perforated gastric ulcer which was followed by a long-persisting sinus. Incision finally showed at the bottom of the sinus a fecal and calcareous concretion. It is not known if this mass came from the stomach. Foreign bodies in the intestine may deceive the skiagrapher, though careful operators see that the bowels are well opened before taking the picture.

DR. JOHN B. ROBERTS said the possibility of erroneous showing of the X-rays is an interesting topic. In one instance under his observation they did reveal that a resident physician was not giving his patient proper attention and reporting all that he should. The patient had diarrhoea and had been given bismuth by the resident without reporting the matter to the surgeon. A skiagraph, taken for a lesion of the hip, incidentally showed by

reason of the bismuth an impacted rectum to which the diarrhœa was due

DR WILLIS T MANGES who had taken the skiagraphs exhibited by Dr Stewart, said the X ray makes no mistake but man makes the mistakes Its character is shown by the fact that by it a foreign body in the eye or other part of the body can be localized and its position determined with absolute accuracy The average hospital skiagrapher has too many cases to examine to do careful work Dr Manges has noticed in other cases shadows similar to those in Dr Stewart's plates In one case with symptoms referable to the genito urinary tract, the kidney region showed no evidence of stone but on skiagraphing the pelvis there was shown two or three small, perfectly round bodies on either side, apparently calcareous or other hard masses These bodies in the pelvis have been noticed only in cases examined for calculi At times it is difficult to distinguish them from calculi but ureteral calculi are rarely found Among the skiagraphs exhibited by Dr Manges was one of a patient who had ureteral or renal colic There was no tenderness of the ureters and catheterization showed no obstruction, there was no blood in the urine Dr Manges made the diagnosis of ureteral calculus The patient refused operation and improved He is undetermined as to the exact condition present The shadows are in the position of ureteral calculi but they are perfectly round Now in such a case, instead of insisting on operation he would say that calculi were not present In another case of renal colic, blood in the urine tenderness but no obstruction to the catheter, the skiagraph showed small shadows which were not round Two weeks later the patient had another attack of colic and a skiagraph then showed no bodies In still another case of Dr Stewart's the skiagraph agreed with the clinical diagnosis but the patient refused operation One year later a skiagraph showed a ureteral calculus still present There was no obstruction to a catheter though the calculus was large as the end of a finger The question is what are the small perfectly round bodies in the pelvis at times in the position of calculi or at other times near the brim of the pelvis where they clearly are not calculi? Dr Manges intends to experiment upon cadavers for the purpose of determining what these bodies are

DR JOHN H GIBBON, referring to the case mentioned by



Dr. Manges in which skiagraphs were taken one year apart, said he examined three plates, each showing the presence of a body. Clinically there were attacks of renal colic. A catheter was passed, but that does not rule out the diagnosis of ureteral calculus, as he believes it possible to pass a catheter when a calculus is present. He believes the man has a calculus. Dr. Gibbon showed two plates, one of a case of ureteral calculus and one in which none was present. The one proved to be no calculus though there was blood in the urine and tenderness over the ureter. The skiagraph shows what appears to be a large stone. The case was very deceptive, but after going over it several times the diagnosis of stone was made. When the abdomen was opened there was found a large hard body, but it was situated in the broad ligament instead of in the ureter. When removing it the mass ruptured, allowing the escape of material resembling white lead. The capsule was tense and it was finally decided the mass was tuberculous. The pathologist has not yet given an opinion as to its nature. This body had cast a shadow in the position of the ureter. The plate that does show a calculus was made from the patient from whom Dr. Gibbon removed the large cystic kidney shown at the previous meeting of the Academy. The calculus was removed by the extraperitoneal method. The patient is making a good recovery.

DR. GEORGE ERETY SHOEMAKER said he frequently turns phleboliths out of the pelvic veins during operations upon women. He has seen a loose calcareous body the size of a pigeon egg free in the peritoneum. Very small dense masses of dermoid material must also be reckoned with forming either the whole or part of dermoid tumors. He has seen one entire dermoid the size of a bantam's egg and one smaller. In one girl a calcareous mass was found against the bladder on the peritoneal side. Cheesy bodies in the pelvis are common. That day he had with difficulty turned out back of the broad ligament a sac with thick organized wall and cheesy contents resembling an ovary. This mass was the result of inflammatory and retrograde changes and would have given an X-ray picture in the line of the ureter.

DR. KELLY, who examined the bodies removed from the frimbria by Dr. Stewart, said there were five bodies about twice the size of the head of a pin and were round and smooth. They were composed of fibrin with calcareous material in the center.

DR STEWART, in closing, said that in addition to phleboliths, foreign bodies in the intestine, calcareous glands, defective X ray plates and dermoids, two other conditions are to be remembered in this connection. First, atheromatous plates in a blood vessel. Second, small, hard, calcareous masses in the end of the Fallopian tubes. The latter seem to be composed of fibrin and calcareous matter. During the past week he found several calcareous masses of this character apparently spring from the fimbriæ of the tubes. These were in the line of the ureter and would have suggested ureteral calculi had an X ray plate been made.

## CORRESPONDENCE.

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### BONE METASTASES OF HYPERNEPHROMA.

EDITOR ANNALS OF SURGERY:

I wish to add to the paper upon the "Bone Metastases of Hypernephroma," which appeared in the December, 1906, ANNALS OF SURGERY, the following two cases of bone metastases, which were accidentally omitted from the cases then reported.

CASE I.—"Report of a Case of Malignant Hypernephroma, with Metastatic Growths in the Bones and Two Spontaneous Fractures of the Femur." E. R. LeCount. Trans. of the Pathological Society (Chicago), 1902, V, p. 82.

CASE II.—"Hypernephroma of the Kidney with a Metastatic Growth in the Superior Maxilla." E. R. LeCount. Trans. of the Pathological Society (Chicago), 1905, VI, p. 373.

CHARLES L. SCUDDER.

BOSTON, MASS.

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**SEVERE BURN FROM VAGINAL DOUCHE.**

By C. Lambert, M.D., N. Y. City.

The case I present I consider of special significance, emphasizing, as it does, the danger attendant upon the use of toxic and irritating solutions, especially in thoughtless and careless hands, and also demonstrating the value of a solution of a non-toxic and non-irritant nature, such as has been brought to a state of perfection in Glyco-Thymoline.

I was hurriedly called to see Mrs. M., age 22, whom I found suffering from a most severe burn involving the vaginal mucous membrane, the epithelium of which was completely denuded, while the perineum and adjacent parts had also suffered quite a loss of epidermis. The destructive process in the vaginal tract extended through the superficial fascia and was quite painful. She had, it seems, obtained a curbstone prescription from a medical acquaintance whom she met on the street a few days previous. Her mind, however, became confused and the proportions as directed, i.e., one dram to two quarts of water, were reversed by her, i. e., two drams to one quart of water, resulting when applied as stated above.

I at once administered a vaginal douche composed of two ounces of Glyco-Thymoline to two pints of tepid water, after which I applied a layer of cotton or loose tampon saturated with pure Glyco-Thymoline within the vagina, and a dressing of the same was applied to the perineum, etc. The tampon I did not renew until forty-one hours later. A call out of the city, which detained me, prevented me from removing it at the end of twenty-four hours, as I had intended to do, and it was with no little misgiving that I hastened to give it my attention. It was, however, only another exhibition of one of Glyco-Thymoline's most valuable properties, as the cotton was as sweet and clean as regards all odor, etc., as when applied, and since then I have frequently assured myself that the preventing of decomposition of the discharges is a most valuable attribute of Glyco-Thymoline. The same dressing, vaginal and otherwise, was repeated at this visit, and at the next I found such decided improvement, the tissues in so healthy a state, that I merely ordered a continuance of the vaginal douche twice a day of Glyco-Thymoline, one ounce to the pint of water, which treatment at the end of another week effected a cure.

**PNEUMONIA FOLLOWING STAB-WOUND.**

By J. A. Davis, M.D., of Norman, Oklahoma.

On January 11th, 1905, Mr. C—aged 20, was stabbed in the back below the scapula, and when I saw him twenty minutes after the affray, he was suffering from profound shock. I carried out the usual operative procedures, and the patient rallied, doing well until the night of the eighth day, when he had a severe chill, presaging pneumonia.

I feared a fatal result, as the left pleural cavity contained considerable bloody serum, and immediately applied a thick dressing of ANTIPHLOGISTINE, 10 inches wide, from the spinal column to the median line in the front, and kept up this treatment for three weeks, changing the dressing every morning. By this time the lung was perfectly clear, and there was no further use for the external application.

The ANTIPHLOGISTINE was covered by a cotton jacket and held in place with a cloth bandage. The pain was relieved by hypodermics of morphine and atropine and the heart was sustained by strychnine. Outside of a little calomel and some laxatives, there was no other treatment. I aspirated the pleural cavity and drew off the serum. In view of the complications in this case, I consider it rather remarkable that the patient made so excellent a recovery. It only confirms my own high opinion of the remedial value of ANTIPHLOGISTINE.

**CHANGES AT H. K. MULFORD COMPANY.**

Arthur P. Hitchens, M.D., succeeds J. J. Kinyoun, M.D., as Director of the Biological Laboratories of H. K. Mulford Company.

Dr. Hitchens has been connected with the Mulford Biological Laboratories for the past eight years, during the greater period of that time having had personal charge of the preparation of Antitoxins and Curative Sera. He is well qualified to conduct scientific work connected with the production of Antitoxins and Biological Products.

W. F. Elgin, M.D., continues in charge and direction of the Mulford Vaccine Laboratories.

E. D. Reed, M.D., of Ann Arbor, Mich., has been engaged to direct research work, particularly in pharmacology and physiological chemistry.

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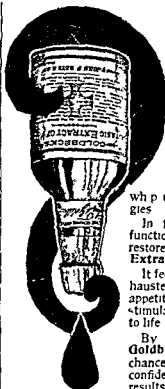
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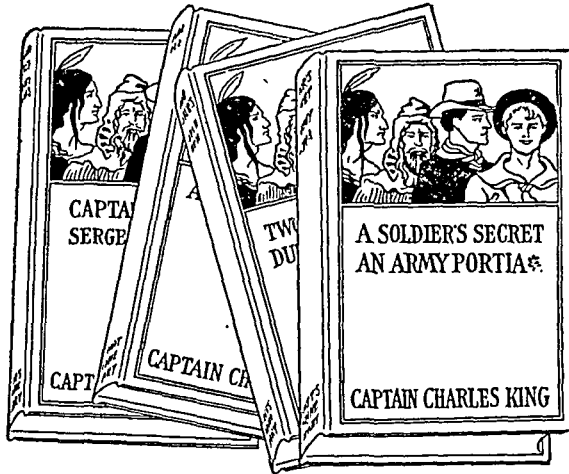
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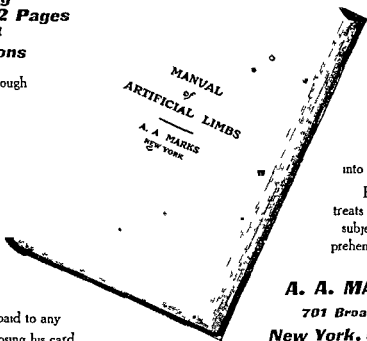
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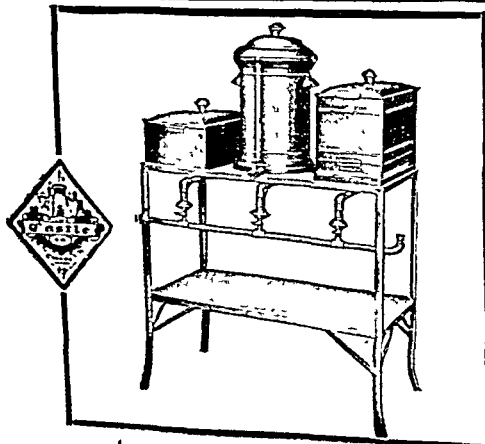
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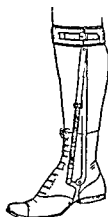
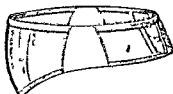
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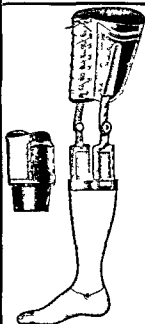
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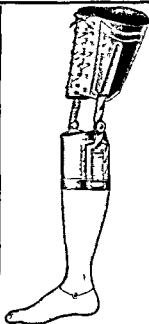
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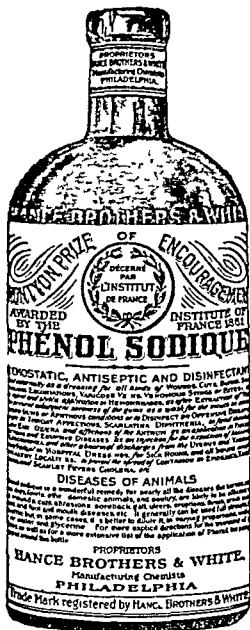
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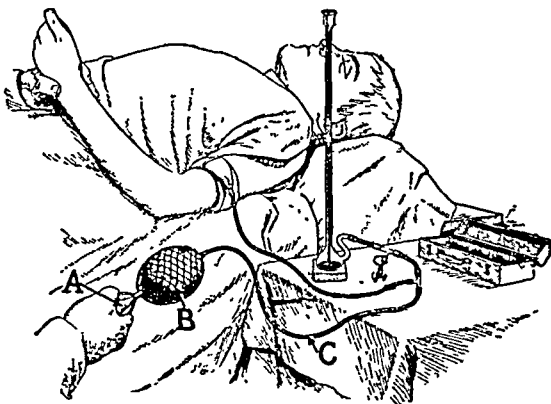
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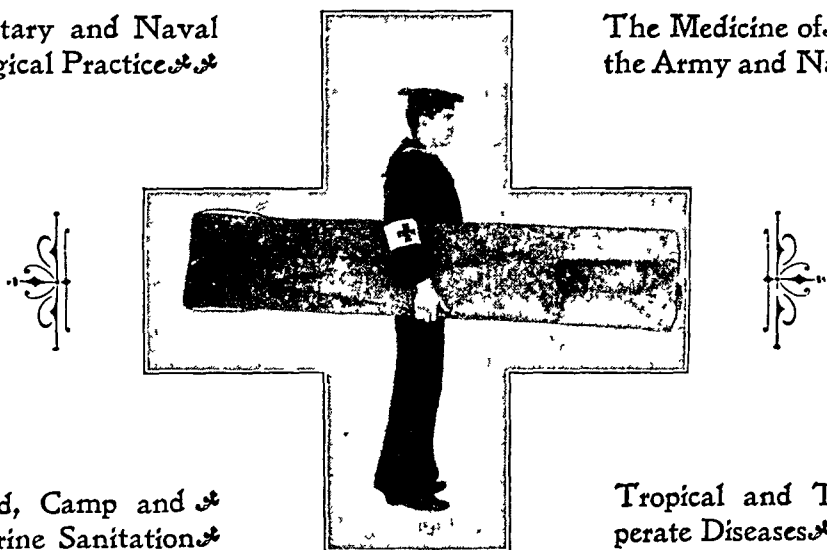
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Major and Brigade Surgeon of United States Volunteers,  
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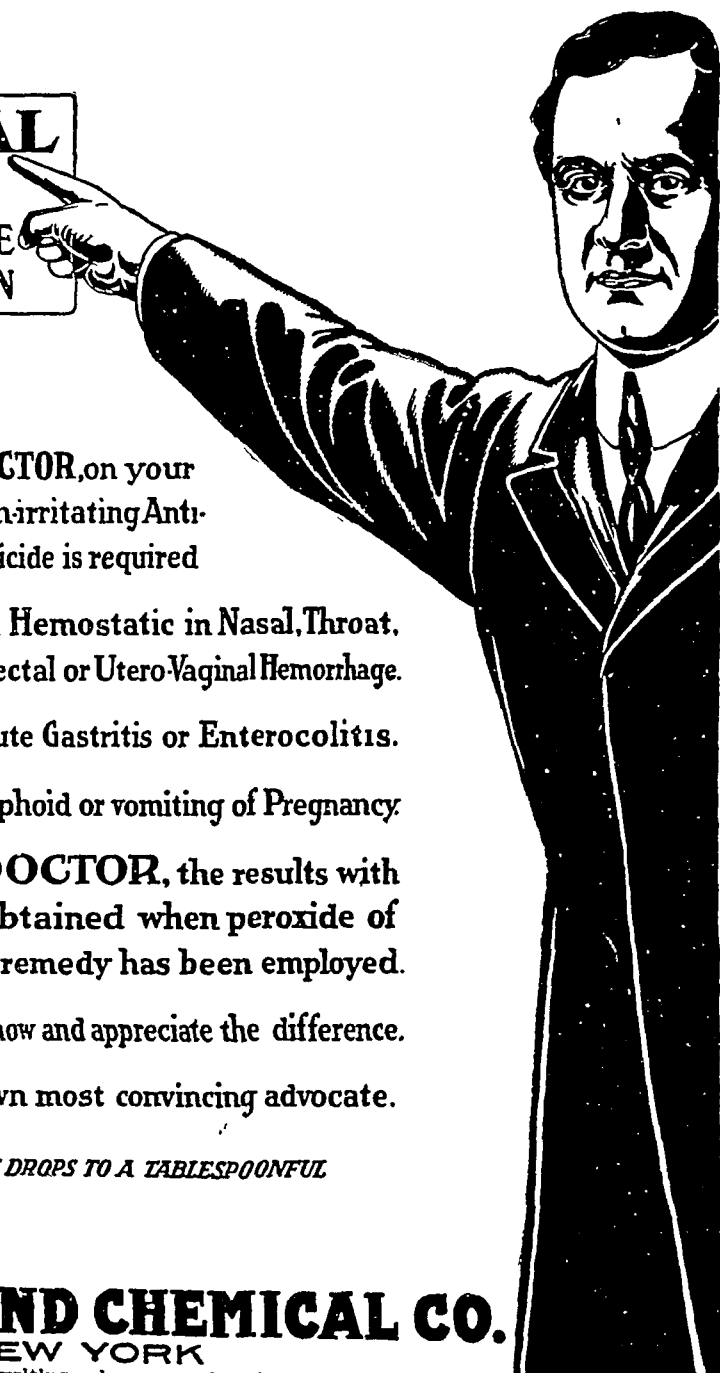
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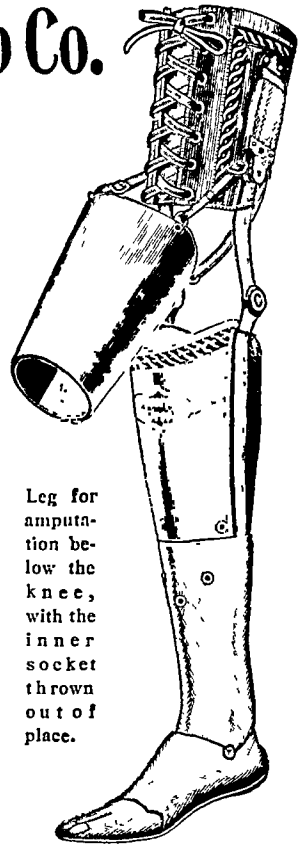
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ANNALS OF SURGERY

VOL XLV

MARCH 1907

No 3

ORIGINAL MEMOIRS

SARCOMA OF THE LONG BONES *

THE DIAGNOSIS TREATMENT AND PROGNOSIS WITH A REPORT OF
SIXTY NINE CASES

BY WILLIAM B COLEY, M D,

OF NEW YORK.

Attending Surgeon to the General Memorial Hospital Associate Surgeon to the
Hospital for Ruptured and Crippled

THE subject of sarcoma of the long bones has for many years been a topic of great interest to the surgeon and the pathologist. The classic paper of Gross¹ published in 1879 based upon a study of 165 cases of sarcoma of the long bones, collected from American and foreign reports, was the first comprehensive work upon this subject. Gross's paper was so exhaustive and covered the ground so thoroughly that it was long before any other writer presumed to enter this field. There were however, certain inherent defects, or rather deficiencies in Gross's paper first, his cases were all treated before the days of antiseptic surgery and, hence, the mortality from operation was exceedingly high, second comparatively few cases were traced to final results, thus rendering impossible any accurate idea of the true prognosis of the disease, third, his cases were collected from scattered reports, mostly individual. Inasmuch as successful or particularly interesting cases

* Read before the Chicago Medical Society December 5 1906.

are much more likely to be reported than failures, such a series of cases as Gross's, would be less apt to conform to the actual clinical picture of the disease, especially regarding results, than a total series of cases observed by a single surgeon or treated at a single clinic.

To fill this gap in our knowledge of sarcoma of the long bones, it follows that we must have a series of cases treated since the advent of antiseptic or aseptic surgery, comprising all the cases observed by a single surgeon or at a single clinic during a given period.

Three papers on sarcoma of the long bones published since Gross's, have, in a measure, fulfilled these conditions. The first, that of Nasse,² based upon a study of 46 cases observed at von Bergmann's clinic during a period of fifteen years, from 1874 to 1889. The second, that of Reinhardt,³ who reports 54 cases observed at the Göttingen clinic (König) from 1880 to 1895. The third and most recent paper is that of O. Kocher⁴ reporting upon a series of 65 cases observed at the Tübingen clinic (Professor v. Bruns) from 1860 to 1903.

It is true that many of the cases observed at v. Bruns' clinic and some of those reported by Nasse date back to a period prior to antiseptic wound treatment; but Reinhardt's series were all treated since 1880.

Mayer²⁰ has taken up the statistics of v. Bergmann's clinic in 1889, or the end of the period covered by Nasse, and has endeavored to complete the statistics up to the year 1904. He has tabulated 91 cases, but, unfortunately, he has not separated the sarcomas of the bones from those of the soft parts, and has also included all sarcomas of the extremities, taking in sarcoma of the fingers, the carpus and tarsus. Hence, it is impossible to compare these cases with Nasse's, or indeed with any series of cases of sarcoma of the long bones proper. No less than 51 of the 91 cases collected by Mayer must be excluded as it is not certain that they originated in the long bones.

Nasse states that while Gross's statistics are of interest in some respects, *e.g.*, his figures regarding the relative fre-

quency of periosteal and myelogenous sarcoma, the proportion in which the various bones are affected the significance of trauma in the etiology of sarcoma, and the many symptoms that are observed in the course of the disease, his material is by no means sufficient to determine the different degrees of malignancy, *etc.*, to express in figures the differences in final results according to the histological character of the disease or the method of operation employed. Such conclusions are particularly worthless when it comes to the different subdivisions of the rarer types of sarcoma. Besides his methods of drawing conclusions are so evidently defective in many ways, that it is impossible to obtain from the same any kind of a reliable picture of the results of operation or the malignity of the sarcomas.

With these important and recent contributions to our knowledge of sarcoma of the long bones it might well seem difficult to find an excuse for another paper upon the same subject.

The two reasons which I offer for the present paper are *First*, the minor one that my series of cases of sarcoma of the long bones is the largest yet reported by a single observer, *second*, one of much more importance, I believe, that the results in this series of sixty-nine cases warrant a very radical departure from the present recognized methods of treatment.

In proof of the fact that new methods of treatment of sarcoma of the long bones are urgently to be desired we need but take a brief survey of the results of present methods.

As I have already stated too few of Gross's cases were traced to final results to enable us to estimate at all accurately the prognosis of the disease. Passing on to the results at Bergmann's clinic (Nasse) we find only 4 of the 46 cases well beyond three years. Of these 2 were myeloid sarcoma of the femur, 1 a periosteal sarcoma of the humerus, and 1 a myeloid sarcoma of the tibia.

The results at König's clinic (Reinhardt), all observed during the antiseptic period show 7 cases well beyond three

years. Of these 3 were sarcoma of the tibia, 1 of the femur, 2 of the humerus, 1 of the radius.

Of the 65 cases observed at the Tübingen clinic, 9 remained well beyond three years. Of these 3 were sarcoma of the femur, 3 of the tibia, 1 of the radius, 1 of the ulna.

O. Kocher was the first writer after Gross to attempt a compilation from the literature of all cases of cures of sarcoma of the long bones. He collected 48 cases which, with the 9 cures observed at Bruns' clinic, make a total of 57. Of these cases 4 were sarcoma of the radius, 1 of the ulna, 10 of the humerus, 23 of the femur, 12 of the tibia and none of the fibula. In the remaining seven the bone is not indicated.

All statistics show that the prognosis is decidedly worse in periosteal growths than it is in those of central origin.

Of the 57 cases of cures of sarcoma of the long bones, 30 were of the myelogenous type, 15 periosteal; in the remaining 12 the exact character of the growth was undetermined.

The nature of the operation performed in these cases of cure is of great interest: 21 were treated by amputation, 10 by ex-articulation, 17 by resection, 5 by curetting. In 4 cases the nature of the operation is not stated.

No one can help being struck by the large number of cases cured by resection; 17, or nearly one-third of the entire number, were thus cured.

The gloomy prognosis of sarcoma of the long bones, even in face of such radical operations as amputation or ex-articulation at the proximal joint, is still further emphasized by Butlin⁵ who, in a series of 68 cases of sub-periosteal sarcoma of the femur collected mostly from English and German clinics, reports only 1 case that remained well beyond three years, and in this case there was some reason to believe that the disease was of central rather than periosteal origin. Of 46 cases of sarcoma of the femur, of the myeloid type, collected by Butlin, 5 remained well beyond 3 years. In the cases of sarcoma of the tibia and fibula, the results were little better. Of 35 cases of the sub-periosteal type, only 1 remained well beyond two years, while of 52 cases of the myeloid type, 9 were well be-

yond three years Butlin was able to collect only 18 cases of sarcoma of the humerus of the periosteal type, that had recovered from operation Of these only 1 was known to have been well beyond three years, of 10 of the myelogenous type, 2 were well beyond three years

Butlin concludes "We cannot but form the opinion that the disease (periosteal sarcoma of the humerus) is horribly and rapidly fatal and that the prospect of complete cure, or even long immunity from recurrence, is singularly small" Of the sub-periosteal sarcomas of the femur, he states "The cases which were followed up by Mr Colby and myself were almost invariably fatal, and in the large majority of them death occurred within a few months of the amputation In many of the cases amputation was performed within three months of the first observation of the disease, in some of them within a few weeks From every point of view, I cannot but regard sub periosteal sarcoma of the femur as a remarkably deadly disease, and I am not yet clear that surgery can do more than palliate the distress occasioned by it, and that only in a comparatively few cases The only hope of the future is in very early diagnosis and in very high amputation"

Sufficient evidence has been cited to prove that the results of operative treatment of whatever kind, of sarcoma of the long bones in general, are extremely discouraging, while those of the sub periosteal type, especially of the femur and humerus, are almost hopeless

My own results of operation for sarcoma of the long bones have been quite as discouraging as those above mentioned The great majority of my cases were treated by the routine methods now in vogue, namely, high amputation or ex-articulation at the proximal joint, in fact, I have resected in no case While I have performed amputation at the hip joint eight times without mortality, 4 of the 6 patients in whom it was performed for sarcoma of the femur, died within the year, the fifth in one and one-half years and the sixth was not traced In 2 in which the amputation was done for sarcoma of the soft parts, 1 died a year later and the other,

who had received several months' treatment with the mixed toxins prior to amputation, now remains well after a period of six years.

While sarcoma of the long bones may occur at almost any age, it is most frequently observed between the ages of twenty and forty. Gross, in 165 cases, found no case under ten years; 45 were between ten and twenty; 55 from twenty to thirty; 26 from thirty to forty; and only 21 between forty and 70.

Reinhardt, in 54 cases observed at the Göttingen clinic, also found no case under the age of ten years. In 35 of the 54 the disease occurred in patients between ten and thirty years; 23 were under the age of twenty.

In 35 cases the tumor had existed less than one year.

The youngest patient of the 65 cases observed at Bruns' clinic was ten years of age; the oldest seventy years; 18 were between ten and twenty; 21 were between twenty and thirty; 7 were between thirty and forty; 15 were between forty and fifty; only 4 were beyond fifty years of age.

My own, as far as I know, is the only series which shows any cases of sarcoma of the long bones under the age of ten years. I have observed 6 such cases, 1 a sarcoma of the humerus in an infant twenty months old, and 4 of the femur in patients aged seventeen months, six, seven and nine years, respectively.

With regard to the relative frequency of the disease in the sexes, statistics vary considerably. Gross's collection shows 149 cases in which the sex was known, 87 were men and 62 women. Of the 65 cases observed at Bruns' clinic 42, 64.6 per cent., were men; 23, 35.4 per cent., were women. Reinhardt's collection of 54 cases observed at the Göttingen clinic gives 40 occurring in men and 14 in women.

My own series shows a much more equal distribution between the sexes: 35 cases in the female, and 34 cases in the male. My oldest patient was aged fifty-six, and youngest twenty months. Six patients were under the age of ten years; 20 from ten to twenty years; 19 from twenty to thirty

years, 11 from thirty to forty years, 5 from forty to fifty years, 7 from fifty to sixty years

Distribution of Sarcomas Over the Various Long Bones (author's series) Femur, 36, humerus, 13, tibia, 13, fibula, 2, radius, 3, ulna, 2, metatarsal bone, 1, metacarpal bone, 1
Total, 71 34 periosteal 22 central 15 type not stated

Method of Treatment Amputation, 20, disarticulation, 16, conservative methods (resection), 6, no operation, 29

A brief reference to the various methods that have been employed in the treatment of sarcoma of the long bones by the different operators may be of interest

At Bruns' clinic (65 cases), of 57 cases treated by operative methods, amputation was done in 21, exarticulation in 10, resection in 17, curetting in 5, in 4 cases the method is not stated

Resection was confined chiefly to the myelogenous type and was performed in only 3 out of the 17 cases of periosteal origin

Thirty of the 45 cured cases of sarcoma of the long bones collected by O Kocher were of the myelogenous type, 15 of periosteal origin It is interesting to note that the method of resection was employed in 16 of these cases

As to the relative frequency of involvement of the various long bones, Gross's statistics show the femur the seat of the disease in 67 cases Tibia, 46, humerus, 25, fibula, 13, ulna, 7, radius, 6, ulna and radius together, 1

Bruns' cases show the femur involved in 23 cases Tibia in 12, humerus in 10, radius in 4, ulna in 1

Nasse reports 15 cases of the femur, tibia, 10, humerus, 9, radius 3, ulna, 1

McCosh, in his paper⁶ reporting the results of 125 cases of sarcoma of all regions, personally observed at the Presbyterian Hospital during the last fifteen years, states that "the majority of surgeons recommend amputation in all cases," and adds that he has never yet seen a case in which he felt that the interest of the patient would have been better served by resection than amputation McCosh's personal results are, I

believe, the best that have been reported. Five out of 11 patients upon whom he performed amputation for sarcoma of the femur or tibia were well over four years. But, in spite of McCosh's opinion, and the fact that up to comparatively recently my own views and practice have been in accord with his, I am now inclined to believe that resection should be employed in a much larger number of cases of sarcoma of the long bones, particularly of the myeloid type in the radius and tibia, and the results obtained by v. Mikulicz⁷ and others, principally German surgeons, seem to justify such a change of attitude. I believe also that the use of the mixed toxins of erysipélas and bacillus prodigiosis after operation will greatly widen the limits within which the operation of resection may be safely employed.

The following cases will, I think, justify this conclusion :

CASE I.—*Sarcoma of the Radius Treated by Resection. Patient Well Six Years Later.*—Mrs. C. H., 26 years of age, first noticed a tumor in the lower end of the right radius in January, 1900. F. H. negative. No history of trauma. The tumor slightly increased in size, and on September 18, 1900, she was operated upon by Dr. R. A. Hibbs of New York. In a letter received from Dr. Hibbs, he states that 2 inches of the radius were removed. Microscopical examination showed the growth to be a giant-celled sarcoma. The space left from the operation gradually filled with granulations and remained open, requiring frequent packing, for nearly two years. In January, 1902, she consulted me for an opinion. At that time the granulation tissue so closely resembled a new growth, that I believed a recurrence had taken place, and advised amputation of the arm. She thereupon consulted Dr. Wm. T. Bull and Dr. Farquhar Curtis, both of whom advised amputation of the arm.

No further treatment of any kind was given except the continued packing of the wound until it finally healed.

I made a careful examination of this patient on November 28, 1906, six years after the operation, and nearly five years after I had previously seen her. There was not the slightest trace of a local or general return. The outer portion of the lower end of the radius has been replaced by new bone. She has perfect

control of the wrist movements and her arm is apparently as strong as before

This case is certainly a very striking proof of the superiority of resection to amputation in certain myeloid growths of the radius

The following case shows that with the aid of the toxins resection may be successfully applied even to the more malignant sarcomas of the humerus

CASE II—Giant Round Celled Osteosarcoma of Humerus—

A C, female, 31 years, patient of Dr John Babst Blake of Boston In December, 1896, the patient fell, striking the right side, three days later she noticed pain in the left shoulder, especially on motion This slowly increased and in November, 1897, motion was limited and she was unable to use the arm At this time the patient noticed a painful lump below the left clavicle She entered the hospital on the twenty second day of December, 1897 Physical examination by Dr Blake at that time showed on the left side just over the coracoid process, a small, oval, slightly tender and rather elastic swelling, skin movable and normal over it Movements of shoulder limited especially in exterior rotation, abduction and extension, limitation apparently due to pain

December 24 1897, operation by Dr Blake The coracobrachialis and pectoralis minor seemed directly continuous with it On separating pectoralis major and deltoid a bluish mass appeared Dissection being stopped by hæmorrhage, mass was scooped out with the hand The tumor apparently originated in the coracoid process and had destroyed the end of the humerus, both tuberosities and the entire glenoid cavity The wound was irrigated with corrosive and four wicks were inserted—one toward neck of humerus one to coracoid one to glenoid cavity and one behind greater tuberosity Wound healed remarkably well On January 18, 1898 a course of toxin treatment was begun and continued until July 28, 1898, the patient receiving in all from 20 to 25 injections Pathological diagnosis proved the growth giant celled sarcoma November 27, 1906, or nearly nine years since the operation, Dr Blake writes that the patient is well and strong, doing all the housework for a family of six, she has extraordinary motion lacking only a certain amount

in direct extension upward of the hand and arm overhead. She has gained nearly 20 pounds. Dr. Blake showed her before the meeting of the American Medical Association in June, 1906.

Etiology.—It would be neither proper nor profitable to take up the question of etiology in a paper of this kind, but I may be pardoned for briefly stating that I believe sarcoma as well as carcinoma to be of microparasitic or infectious origin. The recent experiments of Drs. Beebe and Ewing with sarcoma in dogs have proved that these tumors can be easily transplanted from one dog to another; that such transplanted sarcomata are true new growths, and not infective granulation tissue, and while as yet there is no positive proof of their parasitic origin, to my own mind this explanation is most in accord with the known clinical facts. Whatever theory we adopt as to the origin of this disease, such theory must take into account the intimate relationship between sarcoma and antecedent injury or trauma.

In a series of 615 cases of sarcoma personally observed, there has been a history of injury in upwards of one-third of the cases. This fact is of too frequent occurrence and has been established by too unimpeachable evidence to be any longer thrust aside as an unimportant coincidence, without etiological significance. In a large number of the cases the tumor developed immediately after and at the exact point of injury in persons hitherto in a state of perfect health. If for the moment we assume sarcoma to be of micro-parasitic origin, it is most easy to explain the part that trauma plays as a causative factor: We know that tuberculosis is not infrequently localized in a given part of the body, a joint or a bone, by reason of a local trauma. Uhlmann (Warren's Surg. Path., p. 195, Osteomyelitis) states that, as a result of a large number of carefully conducted experiments, he was unable to produce the disease (osteomyelitis) by injection of the virus, until some kind of injury had previously been inflicted upon the bone. Therefore, we have reason to believe that the infectious cause of sarcoma, whatever it be, may remain for a long time,

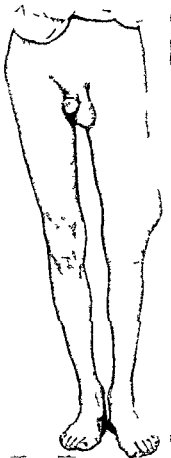


FIG. 1.—Acute traumatic sarcoma of the femur following fracture (periosteal)



FIG. 2.—Acute traumatic sarcoma of the femur (periosteal).
(Sagittal section.)

or perhaps indefinitely, in the system without harm, until the injury produces such a lowering in the vitality of the parts and their resisting power that the slumbering process becomes active and the neoplasm begins to develop

In sarcoma of the long bones a history of trauma is even more frequent than in sarcoma of the soft parts. Gross found it in 70 cases in a total of 144 cases, Mayer found it in 31 per cent of cases, Remhardt in 16 per cent of cases, Nasse in 15 per cent of cases, Kocher in 20 out of 65, Ziegler in 67 out of 171. My own cases show accidental injury in 31 cases out of 66 in which the presence or absence of trauma was noted, or 47 per cent. In 3 cases the sarcoma developed at site of a fracture

Diagnosis of Sarcoma of the Long Bones—Given a tumor of the long bones the most important step towards making a correct diagnosis is to get a careful clinical history of the case. Points of special importance

- (1) The age of the patient
- (2) Presence or absence of a history of local injury
- (3) Hereditary influence, remembering that sarcoma not infrequently occurs in persons whose ancestors died of carcinoma
- (4) General health of the patient may aid in differentiating sarcoma from tubercular disease, patients suffering from sarcoma, especially in the early stages, being usually persons in the most robust health
- (5) Location of the swelling as regards proximity to a joint
- (6) Presence or absence of pain
- (7) Duration of the growth
- (8) Periosteal or central origin of the tumor
- (8a) Consistence of the tumors (presence or absence of fluctuation)
- (9) X-ray examination
- (10) Examination of the blood
- (11) Microscopical examination of a section removed either with a tumor punch, or by exploratory operation

The condition that most closely resembles sarcoma of the bone is tuberculosis of the bone; its similarity is often so great that the most expert diagnosticians have failed to differentiate the two conditions. In some cases it may be quite impossible to make a diagnosis without the aid of a microscopical examination of a specimen removed, but inasmuch as there are certain risks connected with these exploratory incisions, it is most important to be able to make a diagnosis, if possible, without such aid. In the great majority of cases of sarcoma of the long bones, the following clinical picture will be found to be sufficiently accurate to enable one to render a correct diagnosis: The patient will almost always be between 10 and 50 years of age, the majority between 20 and 40; general health will be perfect; there will be no family history of tuberculosis and no evidence of previous tubercular lesions. There will be a history of local injury of some sort in one-third to one-half of the cases—a blow, a fall, fracture, a severe sprain—at some longer or shorter interval, usually less than six months, prior to the first appearance of the tumor. The first symptom the patient will have noticed will be local pain or local swelling, in about equal proportion of the cases. Gross states that pain occurs as first symptom in 62 per cent. of the cases, a tumor in 33 per cent. In many of my own cases pain has been absent as an early sign, and not of great severity until the later stages of the disease. The cases in which pain has been an early symptom have usually been treated for rheumatism for a longer or shorter time. In upwards of two-thirds of the cases of sarcoma of the long bones the tumor will be found located in one end of the bone, the lower end in the femur, the upper in the tibia and humerus, probably starting in the epiphysis, but very rarely invading the joint except in the later stages of the disease. In a few cases, especially those of the femur and tibia, it begins in the middle of the bone, and here it is nearly always the periosteal type, forming a fusiform enlargement of the shaft in the early stages when the diagnosis is important and treatment of value. The duration of the tumor or rapidity of its growth is also an important diagnostic sign.

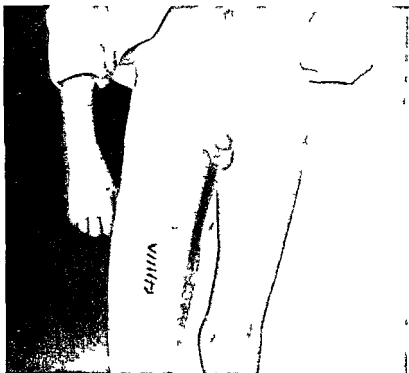


FIG. 2a Sarcoma of the femur. Acute traumatic malignant.
Photograph taken three weeks after a kick.

In nearly all cases the rate of growth is much more rapid than in either tuberculous or syphilitic swellings. In tuberculosis the joint is early invaded, there is more limitation of motion in the joint and more atrophy of the muscles of the limb above. Seen in the later stages when the whole joint is affected by the disease and the patient has become emaciated and exhausted, the similarity of sarcoma to tuberculosis is very great.

The consistence of the tumor in sarcoma varies greatly with the type of tumor. In growths of periosteal origin, in the early stages, the consistence may be very firm, later on, when the tumor has reached considerable size, especially in the round celled variety, the consistence may be very soft and semi fluctuating, the tumor itself being soft and mush like in appearance. In other cases of periosteal sarcoma while the consistence of the tumor in general may be quite firm, there may be areas of marked softening and, in some instances, fluctuation due to the liquefaction of bone or cartilage. The introduction of a sterile needle with the withdrawal of clear serum will enable us to differentiate the condition from tuberculous abscess. In still other cases, particularly the myelogenous sarcomas of the upper end of the tibia, the tumor may show areas of softening similar to those described and other areas which, on palpation, give the egg shell crackling sensation which is fairly characteristic of the disease.

The temperature may offer some slight help in the diagnosis. A regular evening rise of temperature of 1 to 2° would be slightly in favor of tuberculosis although it is not at all infrequent to find slight, irregular temperatures in sarcoma of the femur even in the early stages.

I have on several occasions observed a temperature of $99\frac{1}{2}^{\circ}$ to 100° or 101° in sarcoma of the femur, and in some cases of sarcoma of bony origin I have seen a temperature of 103° .

In the very rapidly growing sarcomas of the bone, the tendency to rise of temperature is more marked. Involvement or non involvement of the joint is of the utmost importance in

differentiating the two conditions. As stated before, in sarcoma the joint is very rarely involved, never in the early stages except in the exceedingly rare cases where the sarcoma begins in the synovial membrane (Rydygier).

v. Ruediger Rydygier, Jr., in his recent "Contributions to the Diagnosis and Therapy of Primary Sarcoma of the Knee-Joint Capsule," states that while sarcoma of the region of the knee joint is by no means rare, he has been able to find only 9 cases of primary sarcoma of the synovial membrane, to which he adds one case observed at Rydygier's (his father's) clinic. He has found all authors to lay special stress upon the great diagnostic difficulties of this trouble, and claims that the case observed at Rydygier's clinic is the first one in which the diagnosis of sarcoma was made before operation. The disease in this case had existed for two years prior to operation, showing the unusually slow course of sarcoma in this locality. Resection was done and the patient remained free from any signs of recurrence when last seen, a year after operation.

Rydygier points out the following characteristic symptoms of sarcoma of the synovial membrane:

In spite of the considerable swelling of the knee-joint region, motion is usually very little impaired, which he thinks is due to the fact that the periosteal covering of the joint surfaces and bone in most cases remain intact, the disease having no tendency to invade the neighboring parts. For this reason, too, there is absence of crackling or crepitus on motion, a sign generally seen in advanced stages of tuberculosis. There is little or no interference with walking, so that atrophy of the muscles is rarely pronounced. Pain, as a rule, is absent or insignificant. Puncture invariably showed sero-sanguinolent fluid or blood, but never pus. The inguinal glands were not involved in any of the cases observed, and with exception of one case, there was no rise of temperature in any of the reported cases.

Examination of the blood shows nothing at all characteristic. There is apt to be a slight leukocytosis, which may reach from 15,000 to 20,000, and occasionally there is an increase in lymphocytes, also an increase in the eosinophiles.

The contour of the tumor is of considerable importance. In tuberculosis starting in the epiphysis and soon involving the joint, the clinical picture is very different. There is swelling of the whole joint, more or less symmetrical, while in sarcoma, especially of the femur, the swelling is apt to be unilateral or more or less irregular, and does not extend into the joint, but

further up the shaft of the femur than is seen in tuberculosis. Not infrequently there are areas of softening or fluctuation in sarcoma, which can be made out on deep palpation and are due to the formation of a cyst by liquefaction of bone or cartilage, but this fluctuation never communicates with the joint, a fact which enables us to differentiate the trouble from tuberculosis. The color of the skin may be of significance, it is less pale than found in tuberculosis, and at times distended veins give it a bluish color.

While it is always wise, if possible, to have an X-ray photograph made of the tumor, in the great majority of the cases nothing characteristic will be found, except perhaps in the later stages when the diagnosis is easy without the X-ray. In the early stages—I agree with Butlin—that it is not only of little help, but in certain cases entirely misleading. The X-ray may be important in showing periosteal or central origin of the tumor, but I do not agree with Kramer¹² in regarding it as a valuable aid to diagnosis in the early stages.

The differential diagnosis between sarcoma and syphilitic lesions is not nearly so difficult. There will usually be found evidence of syphilitic trouble elsewhere in the body, even if no history of primary disease can be elicited. In addition to this, the fact of the much slower growth, the location of the tumor in the shaft of the bone rather than the extremity, will be sufficient to establish the diagnosis. There is one other condition, to which I have not seen attention previously called, but which in a case personally observed was mistaken for sarcoma by surgeons of great experience, and that is osteo-arthritis. In this case the X-ray was of decided help, as it showed a much larger amount of new bone formation and this formation much more irregular in character than is often seen in sarcoma. In addition the marked, almost complete ankylosis of the joint was most significant. Finally, further examination showing typical osteo-arthritic enlargement of every joint in both hands, made the diagnosis of osteo-arthritis of the knee certain.

In some cases, and perhaps in a considerable number, it

may be important to establish the diagnosis before the clinical signs are sufficiently marked to render this possible with any degree of certainty. In these cases we may remove a portion of the tumor either by means of a tumor punch, or, better, a simple exploratory incision. I believe that certain risks are attached to these preliminary explorations, due to the possibility of infected cells getting into the circulation, thus setting up metastases in other portions of the body. The advantages, however, to be gained by such positive knowledge of the nature of the growth, enabling the surgeon to apply immediate treatment, whether it be amputation or injections with the mixed toxins, far outweigh the dangers from exploratory incision. If the patient is put upon the toxins within a few days thereafter, I believe that whatever cells may have been carried through the circulation will by that time still be in a state of such unstable equilibrium, that they will probably be destroyed by the toxins. As a matter of fact, the early appearance of metastases after amputation in cases in which no preliminary exploration was made, has proved that the infected cells enter the circulation early in the disease.

I do believe it is impossible, in many cases, to make a differential diagnosis between sarcoma and cyst of the long bones, without a careful microscopical examination. In a few cases one may be able to differentiate the two conditions from the following points:

(1) Cyst of the long bones is very rare, D'Arcis, in 1906, having been able to collect from the literature but 31 cases.

(2) Nearly one-half of the total number of cases have been found in the upper end of the femur, a relatively infrequent seat for sarcoma. Six occurred in the upper end of the tibia, six in the upper end of the humerus.

(3) Another important point is that cysts of the long bones are, as a rule, of much longer duration than sarcoma. A history of trauma and spontaneous fracture are found with almost equal frequency in sarcoma and cyst. To show the difficulty in making the diagnosis, I would cite the following case:



FIG 3—Sarcoma of the femur and lum (Coey) Two months duration in infant aged one year and nine months

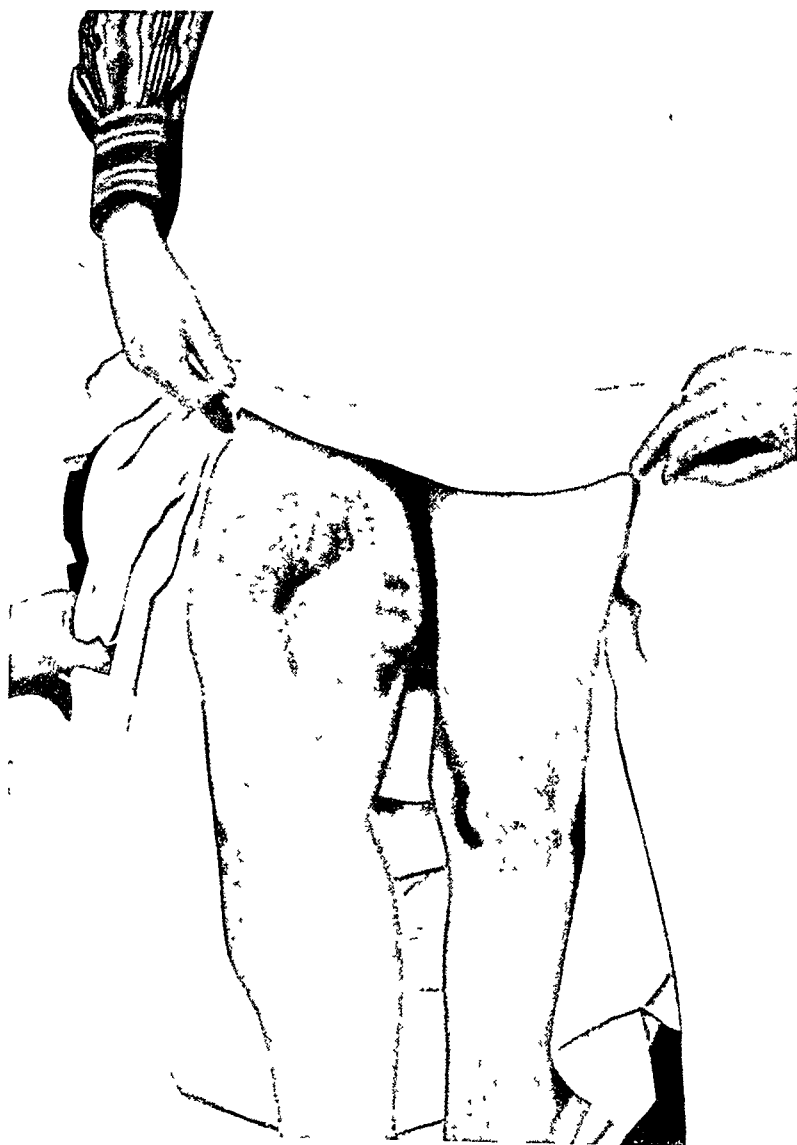


FIG. 4.—Sarcoma of the femur (myeloid).



Г 5 —Per osteal sarcoma of the femur II p joint amputated



FIG. 6.—Periosteal sarcoma of the femur. Specimen removed from patient shown in Fig[5].

CASE III—J S, aged twenty years, F H negative The patient was referred to me by Dr Townsend of the Hospital for Ruptured and Crippled, and admitted to the General Memorial Hospital March 7, 1906, with a history of having sprained his right ankle four years ago A slight swelling appeared which never entirely disappeared In July, 1905, he began to have pain on standing on the right leg This pain and disability gradually increased up to the present time, and he has been unable to work since December, 1905 An exploratory incision was made by my associate, Dr Downes, and on cutting through a very thin layer of bone just above the malleolus on the inner side, a large cavity was opened extending 4 to 5 inches upwards The same was filled with clear serum and of the lower end of the tibia there remained only a thin shell Macroscopically, there was nothing that resembled tumor tissue, the case seemed to be one of those rare cases of cyst of the long bone A piece of the bone removed with a chisel, however, was decalcified and microscopical examination proved it to be a *round-celled sarcoma*

The toxins were given four to five times a week in large doses from March 7 to July 6, 1906 The patient was able to get about more easily The leg decreased 1 inch in size His later history I have not been able to trace

I feel sure that had not great care been taken in removing a piece of the bony shell and having it thoroughly decalcified, the case would have been reported as a cyst of the long bone

This case helps to confirm the opinion of certain authorities who believe that practically all cysts in the long bones are really sarcomas

For further aids in diagnosis the reader is referred to the recent papers of Kummer,²¹ Lexer,²² and Bokenheimer²³

Reinhardt states that in spite of most careful consideration of all diagnostic points it is impossible in a certain proportion of cases to render a positive diagnosis without puncture or exploratory incision In all cases of sarcoma of the bone observed at the Gottingen Clinic between 1880 and 1895 in which there was the slightest doubt as to the diagnosis, the tumor was incised or, if necessary, a piece of bone removed In 54 cases exploratory incision was considered necessary in 34 Two of these were punctured, 29 incised In one instance enlarged inguinal

glands were removed prior to the main operation, and the diagnosis rendered on basis of examination of these. In two cases the diagnosis of tuberculosis disease of the joint had been definitely made and resection was begun, when it was seen that the trouble was sarcoma. According to Reinhardt the most frequent difficulty has been to render the differential diagnosis between tuberculosis of the joint or joint-end and sarcoma in the region of the epiphyses. In many cases effusion into the joint adds to the difficulty. He cites a case showing that even after exploratory incision doubt may exist as to whether the disease is sarcoma or tuberculosis.

Sarcoma of the Femur.—More than half of my entire series of sarcomas of the long bones occurred in the femur, namely 36 out of 69.

The ages of the patients range between one and a half and fifty-eight years.

As regards the sexes, 17 patients were females and 19 males.

Amputation at the hip joint was performed in 13 cases; high amputation in 10 cases. In 13 cases no operation was performed, the patients being either too far gone for any operation, or refusing operation, as was the case in two or three instances.

In 4 cases the mixed toxins were used after operation as a prophylactic against further recurrence. Twice they were used in cases of sarcoma of the upper end of the femur, too extensive even for hip-joint amputation. One of these cases was treated at the Montefiore Home for Incurables. The tumor had been pronounced inoperable by Dr. Gerster, of Mt. Sinai Hospital. A specimen removed was pronounced round giant-celled sarcoma both by Dr. Mandlebaum, pathologist to the Mt. Sinai Hospital, and Dr. T. M. Prudden, Professor of Pathology to the College of Physicians and Surgeons, Columbia University. The disease was advanced so far as to produce spontaneous fracture. The patient finally recovered under the mixed toxins and has remained well since more than four years.

In a second case, personally treated by me, the result was even more remarkable, since here we had to deal with a subperiosteal sarcoma of the small round-celled type, involving

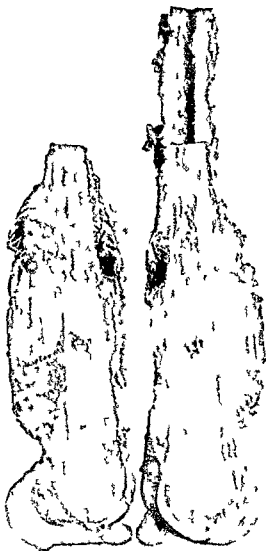


FIG 7—Rounded ends of the femur (proximal) (Bull.)

the lower two thirds of the femur. In addition there were extensive metastases in the pectoral region and the ilio-lumbar region. The patient had absolutely refused amputation. Metastases had occurred while he was taking the X-ray treatment in 1902. Finally, under the mixed toxins, he recovered fully. I presented him before the New York Surgical Society in November, 1906, four years later.

In two other cases the toxins were used before resorting to amputation. One, a case of myeloid sarcoma of the lower end of the femur, in a girl of 16 years, on whom the treatment was begun in April, 1906. The first two to three weeks there was marked improvement, later the tumor again began to increase in size, and at the end of five weeks amputation was done below the trochanter. After the patient recovered from the operation, she was put upon the mixed toxins again and the treatment was kept up for five months at the Hospital for Ruptured and Crippled. She has gained 38 pounds and is in perfect health at the present time, eight months later.

A second case, in which I have used the toxins before amputation in sarcoma of the femur, is that of a boy of ten, with a fusiform round celled sarcoma starting in the middle of the left femur and involving six inches of the shaft. The toxins were begun on the last of November and have been continued up to the present time, February 16, 1907. The tumor at once showed a decrease in size. The pain, which was severe, disappeared after the first two injections. At the end of two weeks there was a decrease in size of one inch. December 25, the doses were reduced from 11 minims to 2 to 3, and an increase was again noted. The patient is still under treatment and the doses have again been increased with the hope of avoiding amputation. January 4, 1907, the tumor is smaller than at any time since treatment was begun, the circumference of the thigh having decreased from $11\frac{3}{4}$ to 9 $\frac{15}{16}$. February 16, 1907, the patient is steadily gaining weight and there is a reasonable hope of saving the limb.

In five cases the toxins were used after amputation in sarcoma of the femur, without waiting for a recurrence. In

one of these cases, a periosteal sarcoma of the middle of the femur, the patient lived two years, dying of local and general recurrence. The other four patients are still alive, but too short a time has elapsed to warrant their being called cures. One is well eight months, 1 seven months, 1 six months, and 1 five months.

The results in the 12 cases treated by hip-joint amputation were as follows:

Of the 6 cases operated on by myself, all recovered from the operation, but the 5 that were traced all had local or general recurrence within a few months, and 4 died within eight months and the fifth within a year and a half. One patient was lost sight of after three months. Of the remaining 5 in which the operation was done by other surgeons, but which came under my care before or after operation, the results were as follows:

One, a girl aged thirteen years, operated upon by Dr. Rushmore, remained well when last seen, five years after operation. Of the other 4, 3 died within a year, and the fourth was not traced.

In short, of the 13 cases treated by hip-joint amputation, only 1 was cured, and, without exception, the deaths all occurred within a year after amputation. There seemed to be little difference in the malignancy, whether the tumor was periosteal or myeloid.

Of the cases treated by high amputation below the trochanter, 10 in number, 1 died two years later. (He received toxin treatment for several months after amputation.) One died four months later of metastases in the lungs; a third died seven months after operation of metastases; a fourth died six months after operation. The other cases were treated with the mixed toxins immediately after amputation below the trochanter, and remain well at the present time, five, six, seven and eight months after operation. Two patients have gained between 26 and 38 pounds each and none shows any signs of recurrence. The toxins were given for five months in 2 cases and 2 others are still under treatment.

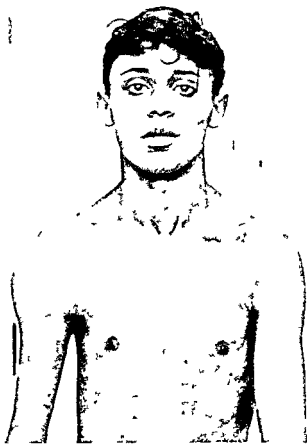


FIG 8—Sarcoma of the humerus (Coley) Two months duration Case IV

Sarcoma of the Humerus—Sarcoma of the humerus is very rare and exceedingly malignant. The upper end of the bone is most frequently involved, but the whole shaft is quickly invaded, the surrounding tissues are infiltrated. In a case which was personally observed and in which I performed amputation at the shoulder joint, half the clavicle was involved and most of the scapula. The disease quickly recurred in the portion of the clavicle remaining, with metastases in the spine. In sarcoma of the humerus, there seems to be a special proneness to recur in the opposite humerus, this has been noted in 2 cases personally observed.

While diagnosis ought to be possible in the early stages a study of the reported cases will show that early diagnosis is seldom made. In 2 cases the patients were treated for rheumatism until the tumors were about the size of a coconut. The rapidity of the growth was undoubtedly enhanced in the one case by the electric vibrator treatment and, in the other, by vigorous application of osteopathy. In neither case had there been any history of previous rheumatism.

The sudden discovery of a hard, painless swelling in the humerus, especially in its upper portion, with or without previous injury, in an apparently perfectly healthy individual, should arouse strong suspicion of the presence of sarcoma. Almost the only condition likely to be mistaken for it would be a chondroma which is much rarer and of very much slower growth.

The following case shows well the extremely rapid course of this disease.

CASE IV—*Sarcoma of the Humerus*—I S., 19 years, born in Germany, admitted to the General Memorial Hospital May 21, 1906, died July 5 1906, no treatment employed. F H negative. On admission the patient gave the following history. No trauma. Pain in the right shoulder for three months, swelling was noticed at about the same time, in January, 1906. The swelling increased very rapidly. The patient first entered Mt. Sinai Hospital on April 10 and amputation at the shoulder joint was advised by Dr. Gerster. The patient left the hospital, and

when re-admitted a month later, the tumor had increased so markedly, that operation was entirely out of question, and the man was referred to me by Dr. Gerster. Examination at this time shows the right humerus the size of an adult head, measuring $10\frac{7}{8}$ inches at the elbow, just below the tumor; the tumor itself showed a circumference of 25 inches. The patient's general condition was extremely bad, he was greatly emaciated; weight $95\frac{1}{2}$ pounds. The tumor had grown to such dimensions that the arm, in a recumbent position, instead of lying against the side, was pushed 4 inches outward. Shortly after his admission to the hospital, spontaneous fracture occurred. Sharp spicules of bone punctured the skin at the lower extremity of the humerus; 12 pounds of bloody serum exuded during the next 24 hours; several quarts continued to exude daily until the time of death, July 6. His condition on entrance was such that no toxin treatment was deemed advisable.

This is one of the most rapidly progressing cases that I have ever seen, the total duration of life being about 5 months from the time of the first appearance of pain to death.

The growth in sarcoma of the humerus is so rapid that one can see its increase in size from day to day. In the cases that I have observed, 13 in number, pain has been a fairly early sign, but has not been severe until the tumor has reached considerable size. The tumor originated in the upper end of the bone in all cases except 1, in which it started in the middle. The pain was never marked except in the later stages of the disease. Sarcoma of the humerus shows a greater tendency to infiltrate the neighboring tissues, both bone and soft parts, than sarcoma in any other locality. The axillary glands are not infrequently involved, and the scapula and clavicle are early invaded by the disease. The almost hopeless prognosis in these cases is shown by the collections of Barling¹⁰ and Dent.¹¹

Of the 13 patients in my series, 5 were females, 8 males, and their ages ranged between twenty months and fifty-eight years; 5 were under twenty years of age and only 3 over thirty years. Antecedent injury was noted in 4 of the 13 cases.



FIG. 9.—Case IV. Sarcoma of the humerus (four months later on Coley).



In 10 of the cases the tumor had been observed less than six months, in 3 cases from one to three months

Methods of Treatment—In 4 cases amputation was refused, though strongly urged. Amputation at the shoulder joint was performed in 6 cases, with 1 death from shock. (In this case the tumor was very large. I saw the patient in consultation and advised operation, but it was performed by another surgeon.) Resection was performed in 3 cases.

In the 6 cases in which shoulder joint amputation was done, 1 died of the operation and the remaining 5 all died within four to ten months. Of the 3 in which excision was performed 2 were lost sight of. The third is the case of Dr. Blake of Boston, which I have already reported at length in the present paper. The head of the bone was excised, but it was thought certain that some of the tumor was left behind and the patient was immediately put upon the toxins, she is now well, more than nine years after.

In 3 cases the mixed toxins were used after operation twice after amputation once after excision. The 2 cases in which the toxins were used after amputation were treated by myself, and in both cases the toxins failed to check the return of the disease or to prevent a fatal issue. Yet the fact that the only cure in the entire series of 13 cases (Blake's) was undoubtedly due to the toxins, is sufficient to justify the use of the toxins after operation. In only 1 case did I use the toxins before operation with the hope of saving the arm. In this case a very rapidly growing sarcoma of the humerus in a girl of thirteen the tumor decreased in size during the first ten days but soon began to increase again until, at the end of three weeks, I urged amputation, but the family would not consent and took the patient from the hospital.

The most complete data as regards the end results of operations for sarcoma of the humerus are found in the exhaustive paper of Jeanbrau and Riche (*Rev. de Chir.*, 1905 No. 8). These authors have collected 125 cases in which the interscapulo-thoracic amputation has been performed for tumors of the humerus clavicle and scapula.

Sixty-four of these amputations were performed for malignant tumors of the humerus, with only 2 deaths. Fifteen, or 23 per cent. of these patients, were well from three to sixteen years.

Two of the cases, although classed as sarcomas, must be excluded, as 1 (Berger, seven years) was a myxoma and the other (Berger, sixteen years) an enchondroma. One died seven years after the first operation of generalization after three operations had been performed for local recurrence.

While these statistics show 20 per cent. of cases well beyond the three-year period, they can by no means be taken as an accurate index of the curability of sarcoma of the humerus treated by amputation. They have been collected from the medical literature of all countries, mostly from individual reports and, doubtless, the complete or partial success of the operation has had much to do with the publication of many of the cases. There have probably been many cases of failure which have not been reported.

Sarcoma of the Tibia.—With exception of the femur, the tibia is more frequently affected than any other of the long bones; the fibula much more rarely. The upper end of the tibia is the common site of origin. The disease is more often of central origin and of the giant-celled type. It is much less malignant than sarcoma of the femur and runs a slower course. Here, as in the femur, the joint is not affected in the early stages; and in cases of central origin, when all but a thin outer shell of the bone has been destroyed by the advancing growth, the characteristic egg-shell-crackling sensation may be elicited on pressure.

I have observed 13 cases of sarcoma of the tibia and 2 of the fibula. The ages of the patients ranged between seven and fifty-four years; 6 were under twenty years; 9 of the 15 under thirty years of age. The age of the fibula patients was fifty-four years in each instance. Nine of the cases were females and 6 males.

The location of the tumor in my series was more variable than is usually seen according to other writers. In 6 cases it

was in the middle, in 3 at the lower end, in 4 at the upper end

Methods of Treatment—Amputation above the knee was performed in 6 cases, without mortality. Amputation was advised, but refused by the patient, in 6 cases. Excision was performed in 1 case, and the mixed toxins were used before amputation in 2 cases.

Results—Of the 6 cases in which amputation above the knee was done, 1, operated upon by myself ten years ago, still remains well, 1, operated upon by Dr. McBurney in January, 1894, died seven months later of metastases, 1 developed pleural and general metastases in four months, with death in six months, 1 was not traced, 1 had pleural and lung metastases five and a half years after amputation (Bull) with death six months later, 1 (fibula) lived two years and then died of lung metastases. In short, of the 6 cases amputated above the knee, only one was permanently cured.

Of the remaining cases, 1 in which excision was twice done for sarcoma of the lower end of the tibia with immediate recurrence after both operations was then treated with the mixed toxins of erysipelas and bacillus prodigiosus. The X ray was also used in conjunction with the toxins and the treatment kept up for nearly six months. The tumor disappeared and the patient is still well, nearly two years later.

In another case of sarcoma of the middle third of the tibia, recurrent after operation, I decided to use the mixed toxins before sacrificing the limb. The toxins were begun in February 1899, and continued for two to three months, with the result that the tumor entirely disappeared, and the patient is still in good health, working upon his farm in Chesley, Ontario.

The other cases in which operation was refused have not been traced. In 1 other case, a sarcoma of the fibula, the toxins were used before amputation without controlling the disease, and then amputation was performed. The patient died two years later of lung metastases.

Sarcoma of the Radius and the Ulna Five cases three of the Radius, and two of the Ulna—Sarcoma of the ulna is so extremely rare that the following cases are given in detail.

Butlin states that not a single case of sarcoma of the ulna has been observed at St. Thomas' Hospital in fifteen years:

CASE V.—*Sarcoma of Ulna*.—D. J. S., 25 years. F. H. good. On December 8, 1898, Dr. George Tully Vaughan amputated the right arm in the lower third for sarcoma of the ulna. The patient at that time gave a history of having had a "greenstick" fracture of the right ulna three years before, from which he recovered. Two and a half years later, the bone began to enlarge at the site of the fracture, and about three months later, the bone broke at this point as a result of throwing a stone or cob. Examination at that time (three years after the "greenstick" fracture), showed a spindle-shaped enlargement of the middle of the right forearm, the circumference being $1\frac{1}{2}$ inch larger than the left. The surface temperature was distinctly higher than on the left forearm. The swelling was firm, semi-fluctuating, not tender, except at a point on the border of the ulna where motion and crepitus were felt. A skiagram showed a fracture of the ulna in the middle third and a mass springing from the upper border of the ulna and extending towards the radius. Subsequent exploratory incision showed this mass to be soft, like granulation tissue, attached entirely to the interosseous border and mainly to the upper fragment. A piece was removed for microscopical examination which was made by Drs. Kingdon and Sprague, who pronounced it round-celled sarcoma with a few spindle cells. The patient made a good recovery and remained well until February, 1906, when he noticed an increase in the size of his abdomen, but as he had no pain or discomfort from this swelling, he paid no attention to it. In the beginning of October, he began to have pain and consulted Dr. J. W. Perkins of Kansas City, Mo., who referred him to me. Physical examination made by me on October 29, showed the patient to be well nourished, having apparently not lost any weight, although he looked slightly anæmic. Right arm was absent; there was no local recurrence nor were there any signs of a return of the disease in the axilla. Examination of the abdomen showed the same markedly protuberant, but symmetrically enlarged. Palpation showed the abdomen filled with an enormous tumor, extending from the ensiform cartilage nearly to the symphysis pubis. The intestines are pushed over to the left side. Several large masses, each the

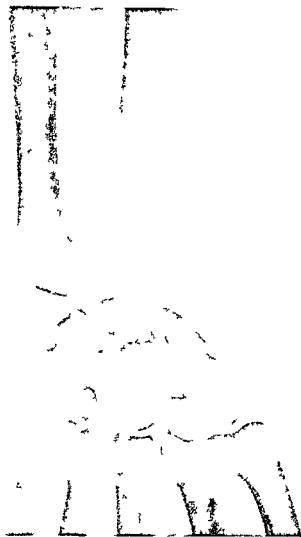


FIG. 10.—Sarcoma of the radius



FIG. 11.—Sarcoma of the radius (Coley). Amputation, and mixed toxins after operation.

size of a child's head, more or less independent from one another, can be made out. They seem to start in the retroperitoneal glands, and be pushing forward. There was no ascites.

The patient was put upon the mixed toxins in November, 1906, with little hope of doing him much good, but at the end of one month's treatment the masses in the abdomen had decreased in size so much that the circumference at the umbilicus was 5 inches less than when the toxins were begun. He is still under treatment.

February 8, 1907.—The tumors are less than one third the size at the beginning of treatment three months ago. He is steadily gaining in health.

The second case I owe to the courtesy of Dr. P. W. Nathan, who has given me the privilege of publishing it. I had arranged to see the patient in consultation, but death occurred in the interval.

CASE VI—*Sarcoma of Ulna*—H. F., 24 years, married, one child, never sick since child was born. In December, 1905, while scrubbing, she knocked the inner side of the right arm against the pail. The arm felt sore for a few days, then was apparently well. About a month later she began to have pain in the arm at the site of the injury and noticed a slight swelling. Both swelling and pain increased. The pain became constant and often kept her awake at night. She soon became emaciated and was slightly cachectic in March, 1906, when Dr. P. W. Nathan saw her. The swelling in the lower end of the right ulna was about the size of a small peach, apparently involving the whole circumference of the ulna. The tumor was hard and smooth and the soft parts were fully movable over it. Wrist and elbow joints apparently normal, tumor not particularly painful on pressure. Amputation was advised, but declined. When seen again by Dr. Nathan, in November, 1906, the tumor was about the size of a small baby's head, extending almost to the wrist at one end and the middle of the shaft at the other, the glands in the axillary and cervical regions were markedly enlarged. There was also a small tumor in the lower end of the sternum and she complained of pain in the back. The spine was stiff in the lower dorsal region. She had œdema of the lungs, heart sounds were very

weak and the patient was extremely emaciated. She died the following day. These two cases show the strong tendency to metastases in sarcoma of the ulna.

Sarcoma of the Metacarpal and Metatarsal Bones.—Sarcoma of the metacarpal or metatarsal bones is very rare, and the former even rarer than the latter. In my list of 615 cases only 3 cases of sarcoma of the metacarpal bone have been observed, and in only 1 of these was the disease primary in the metacarpal bone. This case was one of acute traumatic malignancy, the tumor appearing in a perfect healthy, robust young lady, immediately after a blow upon the back of the hand. It was treated at first as acute periostitis, later, as probable tubercular osteitis. At the end of four months, at which time there was marked thickening of the periosteum as well as metacarpal bone itself, a specimen was removed and microscopical examination proved it to be an alveolar round-celled sarcoma. Immediate amputation at the middle of the forearm did not prevent the appearance of metastases in both breasts in four weeks' time, and death from general metastases, especially in the abdominal and thoracic regions, six weeks later. The early diagnosis in this case was very difficult. Intense pain and tenderness closely simulated an inflammatory trouble, especially as it immediately followed an injury. The failure to find pus in this case, continuation of severe pain, the rapid enlargement of the diffuse swelling of the metacarpal bone with the absence of any tuberculous history, should have made the probable diagnosis possible. In every case of doubt, of sarcoma in either the metacarpal or metatarsal bone, a small portion of the growth should be promptly removed for microscopical examination.

These tumors are exceedingly malignant and temporizing is fatal.

Sarcoma of the metatarsal bones is usually mistaken in the early stages for either acute rheumatism or tubercular

arthritis My own case had been treated for several weeks for acute rheumatism The diagnosis should have been made from the following points

(1) The very severe pain, limited in a single, limited area, rather in the bone itself, than along its articular surfaces, (2) the absence of any effusion about the joint and the fact that no other joints or bones were affected, (3) the fact that neither pain nor swelling were affected by large doses of salicylate, (4) the absence of fever, (5) the gradual but constant increase in size

The diagnosis from tuberculosis could be made from the fact that the patient was a strong, healthy young woman, 26 years of age, who had no family or previous personal history of tuberculosis The character of the swelling itself differed from that usually found in tubercular osteitis The swelling was more diffuse, situated near the centre rather than the extremities of the metacarpal bone There was no inflammatory redness, no adhesion nor caseous degeneration Again, the pain was much more severe than I have ever witnessed in connection with tubercular osteitis Amputation of the leg was performed in this case at the junction of the lower and middle third The patient was put upon the mixed toxins of erysipelas and bacillus prodigiosus immediately after wound healing and the treatment kept up for about four months I examined her in November 1906 five years later, and found her in perfect health

There are two cases in the tables which deserve further notice, they are

FIRST (Case XXXVI) *Sarcoma of the Femur* C C S male, aged 42 years, seen in consultation with Dr L S Pilcher in May, 1905 About eight months prior to his admission to the hospital, he had pain in the region of the knee, following a slight wrench while skating In a few months the pain disappeared and he remained well for ten months and then began to have a return of the pain, which was attributed to rheumatism In December 1904 sudden severe pain developed which compelled

him to go to bed; he remained in bed for two months, then was up and about on crutches for three months. There was no limitation of motion in the knee joint, but a tumor developed in the region of the condyles. This gradually increased in size and in May, 1905, Dr. Pilcher removed a portion of the tumor for microscopical examination. The specimen was examined by Dr. Biggs of New York and several pathologists of Brooklyn, all of whom concurred in confirming the clinical diagnosis of sarcoma. Hip-joint amputation was strongly advised both by Dr. Pilcher and myself, but the patient would not give his consent. He left the hospital, and shortly afterward began taking internal "herb medicines" which he obtained from an advertising clairvoyant physician. He soon began to improve, and after a few months was able to walk. Personal examination January 10, 1907, shows a cicatrix 3 inches long and $1\frac{1}{2}$ inches wide over inner condyle of left femur. The femur seems perfectly normal in appearance and the knee-joint movements are normal. Measurement over the condyles shows one-half inch larger than on the other side, but patient states his right knee has always been swollen, due to hip disease when a child. The patient's general health is good and he walks two or three miles a day without a cane.

SECOND (Case XXI). *Periosteal Sarcoma of the Femur.* Miss R., aged 18 years, examined by me on February 15, 1901, in consultation with Dr. Geo. R. Fowler of Brooklyn. The patient had been treated for several weeks for pain and swelling in the middle of the right thigh. Examination showed a swelling, apparently of bony origin, in the middle of the right thigh, fusiform in shape, somewhat tender on pressure. An exploratory operation was performed at the German Hospital in Brooklyn, by Dr. Fowler, who found a tumor 2 to 3 inches in length, situated on the outer aspect of the middle of the right femur, starting apparently from the periosteum. Examination was made by the hospital pathologist, who pronounced it round-celled sarcoma. Hip-joint amputation was advised by Dr. Fowler and myself, but in this case also, the patient and family refused to give their consent. The patient left the hospital and soon began taking some vegetable medicine. The trouble promptly disappeared and she remains perfectly well up to the present date.

Dr. Fowler and myself endeavored to obtain a slide of the

specimen for further examination, but both specimen and slide had become lost and we were unable to confirm the diagnosis

In view of the short duration and the limited extent of the disease, and the fact that the temperature ranged between 101° and 102° , with considerable pain and tenderness, there is very little doubt that we were dealing with a periostitis rather than a true neoplasm. It would be unfair, however, not to include these two cases, inasmuch as they both fulfilled the test ordinarily applied and accepted as sufficient in such cases, and had amputation been performed, as was advised, we should have had the unquestioned right to class them as operative cures. In the first case I believe the diagnosis was correct, and that the simple exploration with more or less curetting was in the early stage of the myeloid sarcoma sufficient to produce a cure. I have had one case of sarcoma of the lower jaw (myeloid) in which a preliminary operation with curetting resulted in a cure. Such cases furnish strong reasons in favor of the more conservative operations in the myeloid type of sarcoma of the long bones. The other case, I believe, was a case of mistaken diagnosis. Another explanation is that these two cases may have been instances of spontaneous cure. We know that carcinoma in mice shows spontaneous disappearance in many cases, as high as 20 per cent in some laboratories, and Gaylard has collected about 20 cases of spontaneous cure of carcinoma in man. Dr Beebe's experiments at the Huntington Fund for Cancer Research show a certain proportion of spontaneous recoveries in sarcoma in dogs, and there is reason to believe the same thing may occur in sarcoma in man, though such cases must be exceedingly rare.

(See Tables I to IV, page 360, et seq.)

FINAL RESULTS

Ten patients have remained well over three years. One patient with sarcoma of the femur was well five years after hip joint amputation, 1 of the femur, well after five years, no oper-

ation, medicinal treatment,—diagnosis in this case was probably erroneous; 1, a subperiosteal round-celled sarcoma of the femur with metastases, well after five years, treated with the toxins, without operation; 1 of the tibia remains well eight years after treatment with the mixed toxins, without operation; 1 of the tibia, well ten years following amputation of the thigh; 1 of the tibia, well five and a half years after, then developed metastases in the lung; 1 of the tibia, well two years after, recurrent twice after conservative operation, the tumor disappeared under the toxins and X-rays, patient well at present; 1 of the humerus, well after four years after resection, followed by the mixed toxins; 1 of the radius, well six years after resection; 1 of the ulna, well eight years, then developed extensive abdominal metastases; 1 of metatarsal bone, well five years, amputation of leg, middle and lower third, mixed toxins after operation, four months.

The method of treatment that I would propose as a substitute for the present methods is one that I have been gradually forced to adopt by steadily accumulating mass of evidence in its favor.

As early as 1895, in a case of sarcoma of the fibula, I attempted to save the limb by injections of the erysipelas and bacillus prodigiosus toxins. Although there was some slight improvement, this proved to be only temporary, and three months later I amputated above the knee. The patient died of lung metastases two years later.

In 1899, in a case of sarcoma of the tibia, which had been twice treated by local operation, curetting and chiseling, I again attempted to save the limb before resorting to amputation. This time with better result, as may be seen from the following history of the case:

Spindle-Celled Sarcoma of the Tibia.—F. W. F., male, ætat 27 years, farmer by occupation. F. H. good. No tubercular or syphilitic history. In March, 1897, the patient first noticed a swelling over the middle region of the left tibia. This became

red and gradually increased in size. On November 25, 1898, an exploratory operation was done by Dr Stewart of Toronto, Canada. The tissue removed was examined by Dr John Caven, Professor of Pathology at the University of Toronto who pronounced it spindle celled sarcoma. Amputation of the leg had been advised. In February, 1899, the patient was referred to me by Professor Caven in the hope of saving the limb by the use of mixed toxins. He was admitted to my service at the General Memorial Hospital. Examination at this time showed a tumor, anteriorly, in the middle portion of the left tibia 3×4 inches in size, projecting $\frac{1}{2}$ to $\frac{3}{4}$ inch above the normal surface. There were two areas of ulceration, the larger being 1 inch in diameter, no enlarged glands could be detected. The patient was put upon the mixed toxins of erysipelas and bacillus prodigiosus and the injections were continued for about two months. At the end of this time the tumor had apparently disappeared and the ulcerations began to fill up with healthy granulations. During his stay at the hospital he had an attack of accidental erysipelas which he undoubtedly contracted from a patient in the ward suffering from erysipelas. The disease extended over the entire leg and thigh and the attack which was quite severe, lasted for about two weeks. The ulcerations quickly healed up and the patient returned to his home and has been pursuing his regular occupation up to the present time. His health is perfect and he has had no trace of a local or general return of the disease.

Myelosarcoma (Giant Celled) of Tibia—K. K., female, 17 years of age. F H good. P H first noticed pain in ankle in the early part of 1904, then a swelling appeared over the internal malleolus which was painful on pressure. She went to several clinics but got no relief. The trouble was looked upon as tuberculous disease. In September 1904 she was unable to walk. A large swelling appeared over the internal malleolus, with slight effusion into the joint. October 11 1904 she was operated upon at the Hospital for Ruptured and Crippled by Dr V P Gibney. A $2\frac{3}{4}$ inch incision was made and 8 ounces of thick, reddish brown soft material was removed from the lower end of the tibia. The entire lower third of the tibia was apparently involved, only a thin outer shell remaining, fibula and ankle joint were apparently not involved. Microscopical examination proved the tumor to be myelosarcoma (giant-celled). A large local recurrence took

place and on January 3, 1905, this was curetted and the patient was put upon the X-rays and toxins. Thirty-two injections were given at the Hospital for Ruptured and Crippled, after which she was referred to the General Memorial Hospital, where she remained under treatment until July. The tumor which had recurred after operation seemed to be held in check by the treatment. Her general health improved and she returned to her home. Examination on November 20, 1906, showed the patient in perfect health, walking without cane or crutch.

I had not yet reached the point of advising the toxin treatment in cases of periosteal sarcoma of the femur, because of the extreme malignity of the disease and the possibility of metastases occurring during the period of trial with the toxins. Hence, in these cases I still advised hip-joint amputation in spite of the uniform failures this method had hitherto given me.

In 1902, however, a patient, 19 years of age, was referred to me by Dr. W. R. Townsend, of the Hospital for Ruptured and Crippled, with periosteal round-celled sarcoma involving the lower two-thirds of the femur. Both the patient himself and his family absolutely refused to consider amputation, so that I felt justified in this case to suggest a trial with the toxins. The following is a brief history of the case:

Round-Celled Sub-periosteal Sarcoma of the Femur, Involving Lower Two-thirds of the Shaft.—A. G., 19 years. A tumor in the lower portion of the femur was first noticed in November, 1901. There was no history of trauma. This tumor gradually increased in size and was accompanied by loss of weight and deterioration of general health. The patient was referred to me on February 5, 1902, by Dr. W. R. Townsend of the Hospital for Ruptured and Crippled. Physical examination at that time showed a large tumor, occupying the entire lower two-thirds of the left femur, fusiform in shape and most prominent in the region of the condyles. On the outer aspect of the thigh, about $1\frac{1}{2}$ inch above the joint, there was a soft fluctuating area. There was slight impairment of the functions of the joint, but the joint itself was not involved. An incision was made under ether anæsthesia over the fluctuating area and 3 ounces of clear serum,

similar to that found in sarcoma of the bone which has undergone cystic degeneration, was evacuated. By means of a curette a considerable portion of typically sarcomatous tissue was removed. This was examined microscopically by Drs. E. K. Dunham of Bellevue Hospital and B. H. Buxton of Cornell University, and pronounced small, round celled sarcoma. The patient absolutely refused amputation at the hip joint, which I strongly urged.

I was at this time just beginning to try the X-ray treatment of inoperable malignant tumors, and gave the patient four exposures a week. At the end of one month the tumor had decreased in size one inch. The treatment was continued during the entire summer and fall of 1902. The patient gained considerably in weight, but in December, 1902, developed a metastatic tumor in the left pectoral region. This grew very rapidly, and when it had reached the size and thickness of the hand I removed it with scissors and curette under ether anæsthesia. Shortly after this, a large tumor, about the size of a child's head, developed in the ilio-lumbar region on the right side, it filled up the whole iliac fossa and extended up to the ribs. I then put the patient upon large doses of the mixed toxins of erysipelas and bacillus prodigiosus. After about four weeks the tumor in the ilio-lumbar region began to soften and break down. As soon as fluctuation became distinct, I made a posterior opening and evacuated a large amount of necrotic tumor tissue. A tube was kept in place and the sinus drained for about a year. No X-ray treatment was applied to the ilio-lumbar tumor. The sinus in the leg has persisted up to the present time, examinations of several curettings have failed to show any evidence of sarcoma. At the present time, five years from the beginning of the treatment, and four years since the toxins were begun for the metastatic tumors, the patient has remained in apparently perfect health and there is no longer any evidence of sarcoma to be found.

Up to the present time I have been able to collect 12 cases of sarcoma of the long bones. 3 personal cases and 9 reported by other observers, in which the use of the toxins has rendered amputation unnecessary and the limb has been saved.

In 8 of these cases the sarcoma was of the round-celled variety, in 2 spindle-celled and in 2 no microscopical exam-

ination was made, but amputation had been strongly advised in both instances by prominent surgeons.

The period of observation in these cases is most important: 8 were alive and well and free from recurrence from three to eight years, 1 two years, 1 one year; 2 other cases have been observed less than six months.

In 5 of these cases the tibia was involved; in 1 the fibula; in 3 the femur; in 1 the radius; in 1 the humerus (not long bone). In every one of these amputation had been seriously considered, but it was thought justifiable to give the toxins a trial before resorting to operation.

These cases seem to me sufficient in number and the period of observation sufficiently extended to justify us in advocating a course of treatment with the mixed toxins in practically all cases of sarcoma involving the long bones before sacrificing the limb.

It is important to note that in several of these cases, particularly the two cases of sarcoma of the femur, involving the upper end, the disease was so extensive that hip-joint amputation was impossible. In both of these cases the diagnosis had been confirmed by microscopical examination.

If we could offer the patient reasonable certainty of life by amputating the limb, there might be some ground for hesitating to try the toxin treatment before amputation; but, in the face of our inability to save the life of the patient except in a very small minority of cases, I feel that we are risking little in giving the patient the benefit of a brief trial with the mixed toxins. A period of three to four weeks will almost always be sufficient to determine the probable success or failure of the treatment. If a tumor continues to increase in size during this period, then I would not prolong it to the full four weeks, but would amputate at once, and then as soon as practicable continue the toxins as a prophylactic against recurrence. With this important exception I would limit the use of the toxins to *inoperable* sarcoma, which has always been my custom in the past. About 10 to 12 per cent. of such cases hopeless from any other standpoint, have been successful.

The use of the toxins is no longer in the experimental stage, as I have attempted to show in my paper, loc cit (*Amer Jour Med Sci*, March, 1906) In this paper I gave the records of 36 personal cases of inoperable sarcoma in which the toxins have been used with success during the last fourteen years Twenty-six of these cases were well and free from recurrence from three to thirteen years, 21 from five to thirteen years The same paper contains a tabulated report of 60 cases successfully treated by other surgeons, 27 of which were alive and well from three to twelve years, which is sufficient refutation, I think, of the statement occasionally made, that the method has been successful only in the hands of its author

The toxins used in my personal cases since 1894 up to a year ago have been prepared by Prof B H Buxton, of the Loomis Laboratory (Cornell University Medical School) During the last year the toxins have been prepared by Dr Martha Tracy, of the Huntington Cancer Research Fund under Dr Buxton's direction Dr Tracy has, I think, made an improvement over the older method of preparation, which consisting in growing the bacillus prodigiosus in the same bouillon with the streptococcus of erysipelas The growth of the prodigiosus was always variable and it was difficult to get a standard preparation Dr Tracy has, during the last year, grown the prodigiosus separately, sterilized with just sufficient heat to destroy the bacilli reducing the growth to a dry powder and then adding a certain definite amount by weight to each ounce of the streptococcus broth This preparation is much more stable and has proved somewhat more powerful in its action, requiring smaller doses, and the actual results in inoperable sarcoma thus far have shown a distinct improvement over those obtained with the older preparation My own clinical experience, apparently confirmed by Dr Tracy's experiments upon sarcoma in dogs, has proven that the bacillus prodigiosus itself exerts a powerful inhibitory action upon the growth of sarcoma, although I originally added it to the erysipelas with the sole idea of intensifying the action of the streptococcus of erysipelas

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I. SARCOMA OF THE FEMUR.

Case	Date.	Sex.	Age.	Locality.	Duration.	Trauma.	Variety.	Treatment.	Result— Immediate.	Result— Final.
1	1896	F.	11	Lower third. Periosteal.	8 months.	Yes. Fell down steps, injured knee.	Spindle celled.	Hip joint amputation. (Coley.)	Recovery.	Not traced beyond 6 months.
2	1897	F.	13	Lower third. Central.	8 months.	No trauma.	Round sarcoma.	Hip joint. (Coley.)	Recovery.	Died of metastasis in 1½ years.
3	1897	M.	6	Lower half. Periosteal.	6 months.	No.	Round celled.	Hip joint. (Coley.)	Recovery.	Death. Lung metastasis, 6 months.
4	1898	M.	44	Lower third. Central.	2 to 3 months.	Yes. Fracture from kick of horse.	Round celled.	Hip joint. (Coley.)	Recovery.	Death. Lung metastasis, 8 months.
5	1901	F.	50	Upper third. Periosteal.	6 months. Excision. Recurrence.	No.	Round celled. Central.	Hip joint. (Coley.) Toxins 6 weeks after operation.	Recovery.	Death. Metastasis, 8 months.
6	1904	M.	28	Lower third. Central.		Yes.	Round celled.	Amputation upper third. Recurrence in stump. Hip joint. (Coley.)	Recovery.	Toxins after operation. Recurrence. Death, 6 months.
7	1899	F.	8	Lower half. Periosteal.	4 months.		Round celled.	Hip joint. (Bull.)	Recovery.	Death. Metastasis, 6 months.
8	1898	F.	13	Lower third. Myelogenous.	7 months.	No.	Round celled.	Hip joint. (Rushmore.)	Recovery.	Well 5 years later.
9	1897	M.	25	Lower third. Periosteal.	3 months.	Yes.	Round celled.	Hip joint. (Bull.)	Recovery.	Recurred. (Toxins.) Metastasis. Death, 1 year.
10	1905	M.	15	Lower third. Periosteal.	4 months.		Round celled.	Hip joint. (Johns, Markoe.)	Recovery.	Toxins after operation, 3 months. Recurrence. Death, 1 year. Metastasis.
11	1902	M.	16	Lower third. Periosteal.			Round celled.	Hip joint. (Roosevelt Hospital.)	Recovery.	Recurrence. Local toxins. Not traced.

12	1901	M	45	Middle osteal	Peri	3 to 4 months	No	Spindle celled	High amputation (Coley) followed by toxins Later hip joint (Bloom)	Recovery	Recurrence Death 2 years Metastasis
13	1896	F	26	Lower third Central		3 months	Yes Strain	Mixed celled	High amputation (Coley)	Recovery	Death 4 months Me- tastases of lungs
14	1906	F	20	Lower third Central		1 year	No	Round celled Giant celled	Amputation below tro- chanter (Coley)	Recovery	Toxins after operation Gain 39 pounds Well February, 1907 9 months
15	1906	F	16	Lower third Central		3 months	No	Round celled	Amputation below tro- chanter (Coley)	Recovery	Toxins after operation Gain 10 pounds Well February 1907 9 months
16	1906	F	13	Lower third Central			No	Round celled	Amputation below tro- chanter (Whitman Gallie)	Recovery	Toxins after operation Well at present February 1907
17	1903	M	43	Lower third Pe- riosteal		6 months	Yes Fall few months before	Round celled	Amputation hip joint	Recovery Re- curred in six months in stump	Recurrence Treated with toxins 3 weeks no effect Died later About 6 months
18	1906	M	32	Lower third Central		6 months	No trauma	Round celled	Amputation below tro- chanter (Brdman)	Recovery	Toxins begun 2 months after operation No recurrence at present
19	1901	M	50	Upper third		6 months	Yes	Round celled	Exploratory operation 1902	Too extensive for amputa- tion	Toxins for few weeks Little effect
20	1902	M	16	Lower third Periosteal		4 months	No		Amputation advised Refused	None	Not traced
21	1901	F	18	Middle Peri- osteal		6 weeks	No	Round celled	Hip joint amputation advised Refused Took some vegetable medicine from a "cancer specialist"	Recovery	Well at present 5 years later (Diag- nosis doubtful)

I. SARCOMA OF THE FEMUR.—Continued.

Case	Date	Sex	Age	Locality	Duration	Trauma	Variety	Treatment	Result— Immediate.	Result— Final.
22	1906	M.	38	Upper third. Central.	6 months.	Yes.	Round celled. Giant celled.	Tumor extended into groin and iliac fossa. Inoperable. 7 inches larger than other side. Mixed toxins October 21, 1906. (Footc.)	Rapid improvement. Large masses of tumors sloughed out.	Tumor nearly disappeared, November 21, 1906. Patient gradually grew weaker and died early in December, 1906.
23	1905	M.		Lower third. Periosteal.	5 years.	No.	Round celled.	Amputation below trochanter. (Bull.)	Recovery.	Metastasis in face and head 4 months later. Died 7 months after operation.
24	1891	F.	16	Lower third. Periosteal.	1 year.		Round celled.	Inoculated with living cultures of erysipelas; could not produce an attack.	Rapid progress of disease.	Death, 4 months. Exhaustion.
25	1894	F.	21 mos.	Upper end involving ilium.	6 weeks.		Round celled.	No treatment.		Death. 3 months.
26	1902	F.	25	Middle third. Myeloid.	6 months.	No.	Round celled. Myeloid.	Too far advanced for amputation. Toxins a few weeks.	Little effect.	Death.
27	1895	F.	22	Lower end. Periosteal.			Round celled.	Hip joint amputated. (Walker.)	Recovery.	Not traced.
28	1905	F.	13	Lower end.	4 months.	Trauma.	Round celled.	Too far advanced for hip joint operation. Toxins for 4 weeks.	Slight improvement.	Not traced.
29	1902	M.	18	Lower two thirds	6 months.	Yes.	Round celled.	Amputation hip joint advised. Refused. X-ray followed by metastases. Toxins then used.	Recovery. Tumors in leg, pectoral and ilio-lumbar regions disappeared.	Well February, 1907. Four and one half years.

30	1898	F	19	Upper end Central	9 months	No trauma	Round celled (Giant)	Tumor inoperable Ex ploratory incision Specimen removed for microscopic ex amination	Toxins (Els- burg) Two to three months At senic injec tions	Final recovery Union of the spontaneous fracture Well six years later
31	1906	F	34	Upper third	6 months	No	No microscopic examination	No operation May 1906	Improvement	Still under treatment
32	1906	M	10	Middle fusiform Periosteal	5 months	No	Periosteal Small round celled	Exploratory incision Nov 27 1906	Put upon mixed toxins at once	Under treatment Feb 1907 Marked decrease in size gaining weight
33	1904	M	15	Lower third Pe- riosteal	Developed few days after fall	Yes Fall upon knee few days	Round celled	No operation short time	No marked im- provement	Not traced
34	1901	M	23	Lower end Pe- riosteal	1 year	Yes 1 year after injury Fall	No microscopic examination	No treatment Ampu- tation advised	Refused	Not traced
35	1905	M	42	Lower end Mye- loid	5 months	Strain several months be- fore	Round celled	Exploratory operation Dr Filcher Ampu- tation advised May 1905	Slow disappear- ance of growth	Examination January 1907 Femur, nor- mal at present. No evidence of tumor present (final text)
36	1907	M	12	Middle and lower third	3 weeks	Kick, Devel- oped 1 week after	Round celled	Exploratory operation January 15 1907 Dr W R Townsend	Put on mixed toxins Jan 17, 1907	Decreased 1/4 in 10 days Feb 10 1907 be- ginning to increase in size Amputation below trochanter Feb 15, 07

II SARCOMA OF THE TIBIA

Case	Date	Sex	Age	Locality	Duration	Trauma	Variety	Treatment	Result— Immediate	Result— Final
37	1907	F	29	Upper tibia	Second year	Yes Fall	Round celled Myeloid	Exploratory operation Jan 17 07 Dr Gibney	Toxins used to save limb	Under treatment 1 eb to 07 Decrease in size
38	1895	F	11	Middle tibia Periosteal	1 month 3 inches increase in size	Fall 3 months before	Round celled Very vascular	Amputation urged Re- fused Toxins 4 doses only	Lost sight of	

II. SARCOMA OF THE TIBIA.—Continued.

Case.	Date.	Sex.	Age.	Locality	Duration.	Trauma	Variety	Treatment.	Result— Immediate	Result— Final
39	1896	F.	24	Upper end Central	4 months	Yes. Fall down stairs Tumor very soon after.	Round celled. Small round	Amputation 1895. (Coley) Lower third thigh	Recovery	Well 10 years after.
40	1899	M.	27	Middle and upper third Tibia	1 year and 11 months	No trauma	Spindle celled. Periosteal	Mixed toxins of ery- sipelas and B. pro- digiosus. 2 months.	Tumor entirely disappeared	Patient well at present, 8 years later
41	1897	M.	12	Upper third. Tibia Fusiform Periosteal.	1 month	Fall Develop- ed soon after few days	Round celled.	Amputation of thigh (Bull) 1895	Recovery.	Not traced
42	1902	F.	17	Lower end Tibia. Central.	6 months. Pain before swelling	No trauma	Round celled. Giant celled.	Two operations, Dr. Gibney, October 1901, and January 1905. Cureting and chis- eling out of bone Rapid recurrence	Put upon mixed toxins of ery- sipelas and B. prodigiosus with x-ray. Jan 1905 (Coley.)	Treatment continued till July 1905. Tumor disappeared. Patient well January, 1907.
43	1906	M.	26	Lower two- thirds Central.	3-4 years	Yes Cystic cavity. Lower half of tibia a shell.	Round celled.	Toxins 3 months. June, 1906 Tumor de- creased in size. Toxins Much im- proved	Much improved	Not traced
44	1894	F.	35	Tibia Middle.	6 months	No trauma	Spindle celled. Periosteal	Amputation above knee (McBurney). June 27, 1899.	Recovery	Spinal recurrence, met- astasis. 7 mos. Death
45	1904	M.	10	Tibia. Middle. Upper third.		Trauma 1 year before		Amputation advised. Refused		Not traced
46	1905	M.	20	Middle Tibia.	4 years.	Trauma. Tum- or 3 inches larger than other side.		Amputation advised Refused March, 1905		Not traced

47	1906	M	32	Middle	Central	1 year	Yes	Round celled	Amputation of upper third thigh 1906	Recovery	Local and general recurrence Lung pleura and rib 4 mos Died Nov 1906
48	1896	F	50	Lower end		6 months	Yes	Round celled	Amputation above knee (Coley)	Recovery	Not traced
49	1900	F	26	Upper end	Central	Pain and lameness 1 year before trauma	Trauma Fall 1½ years before	Round celled Central	Amputation middle thigh (Bull) February 12 1900	Recovery	Metastasis, lung and pleura 5 years and 6 months Death 6 years six months Toxins used after generalization little effect

III SARCOMA OF THE HUMERUS

Case	Date	Sex	Age	Locality	Duration	Trauma	Variety	Treatment	Result—Immediate	Result—Final
50	1900	F	37	Humerus	4 months	No trauma		April 1900 Operation	Recovery	Recurred 5 months
51	1901	M	17	Left humerus Upper end	6 months	No trauma	Round celled Periosteal Nogiant cells	Exploratory incision and amputation of shoulder joint Dr Bull May 1901	Recovery Local recurrence 3 weeks	Mixed toxins of erysipelas and B prodigiosus begun and continued 3 months Recurrent Tumor disappeared Died November 1901, 5 months after operation Metastasis
52	1900	M	18	Left fusiform Right humerus	6 months of neck	Trauma Brick fell 3 stories Tum or at once	Round celled Periosteal	6 months after first not ed Amputation, Dr George Fowler March 1900 Metastases few weeks later	Recovery Metastases quickly followed with larger tumor in right humerus Aug 1900	Died soon

III. SARCOMA OF THE HUMERUS.—Continued.

Case.	Date.	Sex.	Age.	Locality.	Duration.	Trauma.	Variety.	Treatment.	Result— Immediate.	Result— Final.
996 53	1901	M.	45	Humerus. Right and left. Middle central.	2½ months. Spontaneous fracture.	No trauma.	Round celled. Central.	Amputation of shoulder (Dr. Bull), May, 1900	Recovery. Severe neuralgic pains in chest five weeks later.	Mixed toxins 5 weeks. Pain increased September 1, 1901. Spontaneous fracture of other humerus. Died October, 1901, 6 months after first symptoms.
54	1905	M.	14	Humerus. Left. Periosteal.	5 months. Very large.	None noted but was a football player.	Periosteal (x-ray photo). No microscopic examination.	Amputation advised but refused. Tried X-ray against advice.		Died February, 1906, 10 months from first symptoms.
55	1904	M.	28	Humerus. Left. Axillary glands. Periosteal.	4 months. Very large. Size of a child's head.	No trauma.	Periosteal. Round celled.	Amputation of shoulder, part of clavicle and scapula, February 5, 1904. (Coley.)	Recovery. Recurring three months later.	Mixed toxins tried. No effect. Spinal and general metastasis. Died June, 1904 (7 months).
56	1901	F.	38	Right humerus, upper end.		Strain.	Chondro-sarcoma.	Excision of tumor.	Recovery.	Not traced.
57	1899	M.	58	Left humerus. Upper end.	6 months.	Trauma. 1 month before.	No microscopic examination.	Amputation of shoulder joint advised. Refused.		Not traced.
58	1906	M.	22	Right humerus, Upper end. Periosteal.	4 months.	No trauma.	Round celled.	No operation.	No treatment.	Exceedingly rapid growth size of adult head in 4 months. Death 5 months from start. (<i>vide</i> text and illustrations.
59	1906	F.	13	Upper end. Joint not involved. Periosteal.	3 months.	No trauma. Pain first, swelling soon after.	Round celled.	Preliminary use of mixed toxins, begun November 26, 1906. 3 weeks. Improved at first, later no control.	Amputation advised. Refused.	Patient left hospital on December 23, 1906.

60	1906	F	25	Right humerus Periosteal	6 months	No trauma	Periosteal	Amputation of shoulder advised Operation performed by another surgeon (Campbell)	Death from shock	
61	1897	M	30 mos	Left humerus Nearly whole bone Enostiform	1 month	No trauma	Periosteal	Very rapid growth 3 times size other arm in one month Veins dilated Joint not in- volved	Amputation re- fused	Not traced
62	1902	F	Adult	Right humerus Round celled Myeloid	Pain and stiffness 4 months	Yes Fall 9 months be- fore	Round celled Myeloid	Removed head of bone tip of coracoid pro- cess part of glenoid cavity Dr J Babst Blake of Boston	Treated with mixed toxins after opera- tion	Patient shown by Dr Blake at the Amer- ican Medical Associ- ation Boston June, 1906 Well 9 years

IV SARCOMA OF THE RADIUS, ULNA, AND FIBULA

Case	Date	Sex	Age	Locality	Duration	Trauma	Variety	Treatment	Result— Immediate	Result— Final
63	1898	F	24	Radius Lower third				Operation advised Refused		Not traced
64	1902	F	29	Lower third Right radius No glands Central	8 months	Blow Pain 3 months later 5 months tumor	Round Celled (Giant)	First operation Septem- ber 1900 (Dr Hibbs) Second operation January 1902 Re- currence Amputa- tion advised		Patient alive and well at present Examined by Dr Coley Nov 28 1906
65	1906	F	31	Radius, left, lower end No glands Peri- osteal	1 year pain months tumor	No trauma	Round celled	Amputation (Coley) September 14 1906 Mixed toxins Octo- ber 1 1906, as pro- phy lactic	Recovery	Well at present Feb 1907

IV. SARCOMA OF THE RADIUS, ULNA, AND FIBULA.—Continued.

Case.	Date.	Sex.	Age.	Locality.	Duration.	Trauma.	Variety.	Treatment.	Result— Immediate.	Result— Final.
896 66	1906	M.	25	Ulna. Middle. No glands affected.		Yes. Green- stick fracture 7 years before. Slight swell- ing soon after. Gradual in- crease in size.	Spindle celled.	Amputation of middle arm, 1899. George Tully Vaughn, Washington, D. C.	Recovery. Well 7 years. Re- curred in ab- domen.	Spring 1906, noticed abdomen increasing in size. No pain. Oct. 1906, whole abdo- men filled with tumors of various sizes. Put on mixed toxins Nov. 1906. Tumors nearly disappeared Feb., 1907.
67	1906	F.	28	Ulna. Lower end.		No.		No treatment.	Lung and pleu- ral metasta- sis.	Died in less than 1 year from beginning of symptoms.
68	1896	F.	52	Fibula. Upper end. Joint not involved. Peri- osteal.	Pain 3 years. Swell- ing 2 years.	Fibula. No trauma.	Spindle celled. Periosteal.	Toxins, 6 weeks. Tum- or decreased 1 inch. Later increased. Am- putation, (Coley), November, 1895.	Recovery.	Died of lung metastasis 2 years later.
69		F.	52	Fibula. Upper end. Not in- volved joint. Periosteal.	2 years.	Trauma. Fall. Tumor devel- oped 3 months later.		1898. Amputation ad- vised. Refused.		Not traced.
70	1890	F.	18	Third metacarpal. Periosteal.	4 months.	Blow on back of hand. Tumor developed im- mediately after.	Metacarpal. Round celled. Alveolar.	Exploratory incision. Amputation middle forearm.	Recovery.	Metastasis, both breast and abdomen in 4 weeks. Died 8 weeks later.
71	1901	F.	25	Second metatar- sal bone. Reg- ion, periosteal.	Few months.	No.	Round celled.	Amputation. Leg, Middle.	Recovery.	Mixed toxins 6 mos. Patient well 5 years after operation.

SUCCESSFUL ANTERIOR THORACO-BRONCHOTOMY FOR A FOREIGN BODY IMPACTED IN THE BRONCHUS

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THE literature of operations directed to the removal of impacted foreign bodies in the bronchi, at least such of it as is available to the writer, is exceedingly limited, both as to extent and detail. Such as could be found, dealt with the subject in an indefinite and unsatisfactory manner. In most of the cases cited, no attempt was made to indicate the site of the foreign body, the method of approach made use of, or the conditions which governed the operator in his choice of a method of attack.

The operation of choice has apparently been the more complicated posterior bronchotomy, the reason for which has been that there is less danger of pneumothorax. The few reports of anterior bronchotomy that the writer was able to find, led to the belief that the report of this case might be of interest.

History—J S, male, age 6 years, 9 months, about noon on August 5, 1904, while playing, inspired a small metal collar button of the type in common use by laundrymen which he had in his mouth. He became very much frightened, ran into the house and began to cough. The cough lasted only a few minutes, and the family, thinking that he had swallowed the button, paid no more attention to it. About five o'clock he had a sudden severe paroxysm of coughing and became cyanotic. His mother shook him and the coughing ceased. The boy declared that he felt something move in his "neck." During the night he had several severe paroxysms, became cyanotic, and the dyspnoea was marked.

The next morning he was taken to the family physician,

Dr. G. M. Studebaker, who, after examination, referred the patient to me.

Examination on August 6, 1904, at 9 A.M., showed a fairly well developed boy. The respirations were easy, though slightly limited on the right side. There was some dulness on the right side, anteriorly and posteriorly. The respiratory murmur was very much diminished posteriorly, and almost absent anteriorly. The temperature, pulse and respiration were normal. There was neither cough nor tenderness. Examination of pharynx and larynx was negative. Fluoroscopic examination of thorax was also negative. A diagnosis of a foreign body in the right bronchus was made and operation advised. The parents took the boy home and at first refused operation, but during the night of the sixth his condition became so alarming, from great difficulty in breathing and paroxysms of coughing, with cyanosis, that they consented to an operation.

On admission to the Hamot Hospital on August 7, 1904, at 10 A.M., the temperature was $98\frac{4}{5}^{\circ}$, the pulse 104 and the respirations 22. Examination showed a total absence of respiratory murmur on the right side, no cyanosis, respirations easy, movement limited on the right side.

Operation August 7, 1904, at 10.30 A.M. Chloroform anæsthesia.

Through a low tracheotomy wound a large silver probe was passed and the obstruction could be felt in the right primary bronchus. An attempt was made to remove the button by the use of long dressing forceps, silver wire loops and a curette, but every effort failed to move or grasp it. It was discovered later that the small end of the button was directed downward and the large end was firmly imbedded in the bronchus, the mucous membrane being very much swollen. As it was impossible to remove the button in this manner, I decided to open the thorax.

During the operation on the thorax chloroform was administered through the tracheotomy wound which was held open by a silk suture passed through the wall of the trachea, the chloroform being dropped on gauze held a short distance from the wound.

A curved incision was made, beginning over the second rib just beneath the middle of the clavicle, and carried downward and inward to within an inch of the right margin of the sternum, thence outward to the level of the fifth rib an inch to the inner



FIG. 1. Shows patient after recovery from thoraco-brochotomy for foregut body bronchus.

side of the nipple. The cartilages of the third and fourth ribs were cut about one half inch from their sternal attachment and an osteoplastic flap made by breaking the third and fourth ribs. Through this opening good access to the lung was secured. The lung was found almost entirely collapsed, and the button could be palpated easily through the lung. There was a slight movement of the bronchus with the respiratory act, an assistant by hooking his finger under the bronchus controlled the movements easily. As it was impossible to roll back the overlying lung an incision about one half inch in length was made with a scalpel through the lung into the bronchus. There was practically no hæmorrhage from the lung or bronchus. A pair of artery clamps, introduced through the incision, grasped the button and by a twisting motion it was removed. All of this was done with lung within the thorax. The lung and bronchus were dropped into place, no sutures being inserted. The thoracic wall flap was replaced and silkworm gut sutures were inserted through the muscles. No drainage was used and no fluid injected into the pleural cavity. The tracheotomy wound was closed with sutures, but on account of great emphysema of the cellular tissues about the larynx and neck, causing dyspnoea, which developed shortly after the operation was completed, a tracheotomy tube was inserted. The patient was in considerable shock before the operation on the thorax was begun and the opening of the pleural cavity did not apparently increase the condition. Normal salt solution was injected into a vein and the patient rallied slowly. There was intense tracheal irritation, and severe paroxysms of coughing often expelled the tracheal tube.

At 4 P.M. the temperature was 99° , pulse, 140, respirations, 26. At 8 P.M. the temperature was 102° , pulse, 160, respirations, 40. The dressings were saturated with a slightly blood stained serous discharge. When these were changed it was noticed that with each inspiration there was an escape of air from the pleural cavity. On auscultation a distinct whistling murmur could be heard coincident with inspiration, which was caused probably, by the escape of air through the wound in the lung and bronchus. The next day the temperature varied from $100\frac{1}{3}$ to $102\frac{1}{3}$, pulse, 120 to 140, respiration, 36 to 48. A croup kettle was kept boiling under a tent over the bed and the paroxysms of coughing became less severe. Air no longer escaped from the thoracic wound. The right side of the thorax

was tympanitic, a whistling murmur being heard on inspiration, though not as distinctly as on the previous night. Over the base of the left lung there was slight dulness and breathing almost bronchial in character.

At the end of 48 hours the highest temperature was 101; pulse 116 to 128; respirations, 38 to 56. As the subcutaneous emphysema had disappeared, the tracheal tube was removed and the wound closed with adhesive straps. Healed on sixth day.

There was a gradual improvement in the pulmonary condition; the tympanitic area gradually decreased and the respiratory murmur returned. There was no infection of the pleura, the thoracic wall healing without incident.

On the tenth day the patient was taught to blow water from one bottle to another, and, with this exercise, the lung rapidly expanded. The respiratory sounds were normal on the date of discharge from the hospital, August 26, 1904.

Examination 18 months after operation showed a slight depression over the site of operation on the thorax, expansion equal and good, normal respiratory sounds.

The exact localization of the foreign body, made possible by the exploration through the tracheotomy wound, greatly facilitated the subsequent steps in the operation, the time that would have otherwise been spent in searching for the obstruction was saved to the patient. Unfortunately, too much time—over an hour—was expended in fruitless attempts at removal by way of the trachea. In any future cases where the foreign body was impacted below the bifurcation of trachea, I should do the tracheotomy with greater hope of ascertaining the exact location by that means than of being able to remove the obstruction. Had the button been in such a position that it would have been possible to grasp it with forceps it is questionable if the injury done the bronchus by forcible dislodgement would not have been more disastrous than the bronchotomy.

While it is dangerous to draw conclusions from one case, the fact that forty-eight hours elapsed between the inspiration of the button and its removal and that the patient apparently did not suffer from the delay, might suggest the advisability of waiting not longer than 48 hours for spontaneous delivery.

THE SURGICAL TREATMENT OF EMPYEMA.*

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Four different methods of operating upon empyema are usually described. First, aspiration or paracentesis, second, thoracotomy with or without resection of a rib, third, the Estlander or Schede operation, and, fourth, the Fowler-Delorme method of decortication of the lung. To these must be added one recently suggested by Dr. Joseph Ransohoff, of Cincinnati, in the *ANNALS OF SURGERY*, April, 1906, which is simply a modification of the first method. This he calls "Dissection of the Pulmonary Pleura." It consists of "gridironing" the pulmonary pleura with many parallel incisions removed from each other about a quarter of an inch, and crossing these obliquely, or at right angles, with other parallel cuts.

Of the first two methods little need be said at this time. They are of use in recent cases where the lung is not permanently collapsed and bound down, and will, if the lung expands, as it frequently does in these early cases of operation, result in a prompt and satisfactory cure. The other three methods are intended for the chronic cases of empyema where the lung has collapsed, and where its expansion to fill the pleural cavity is impossible unless some method is adopted to allow the chest wall to fall in against the pulmonary pleura and become adherent to it, in order to close the suppurating cavity, or, as in the last two operations, the lung itself is made to expand so as to fill the suppurating space.

All these methods are based upon the idea that when the

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lung has once completely collapsed and become firmly fixed the pulmonary pleura has lost its expansibility, owing to inflammatory thickening, so that it will not allow a sufficient amount of re-expansion to permit the pulmonary and parietal surfaces to come into contact. It is now over fifteen years since I began to experiment on these cases in order to determine if there was not some way to bring about this complete expansion of the lung without extensive and mutilating operations upon the chest wall. In 1893, when Fowler and Delorme suggested their method, I discontinued experimental work for a short time and adopted the method of decortication, with the idea that this furnished the best solution of the problem. It was not long, however, before I was convinced that the difficulties attending the freeing of the lung from its pleural covering were so great, and the result following the attempt was so often unsatisfactory, that I took up again the experimental work.

Tillman has said that "if in cases of old empyemata the lung, in consequence of prolonged compression, is no longer capable of expansion, the abscess cavity in the thorax cannot completely heal and an empyemic fistula persists, as the rigid bony wall of the thorax does not yield to the cicatricial contraction. In the most severe cases the involved lung is found firmly contracted, the size of a fist, in the upper part of the pleural cavity. In these cases healing can only be secured by a sufficient resection of the ribs to enable the thoracic wall to yield and thus follow the cicatricial contraction." And Dennis, in his *System of Surgery*, also makes the statement that "in cases of empyema of long duration . . . the lung is fixed and cannot expand, the pleura is adherent and inelastic, and the chest is prevented from collapsing; and thus a cavity is permanently formed, the obliteration of which is necessary to effect a cure."

On the other hand, Forcheimer, in his recent work on the *Prophylaxis and Treatment of Internal Diseases*, says that "as a matter of fact we do not find the lung collapsed in opening the chest for empyema, simply because the lung is always

held by pleural adhesions", but he does not say that frequently in these chronic cases we find the lung pushed up and held in the apex, as Tillman says, or else pushed inward and backward, and reduced to a ribbon like mass, running parallel to the spinal column and attached firmly from apex to diaphragm in such a way that expansion is practically impossible. Forcheimer also makes the statement that 'Schede's operation would be uncalled for if the adhesions could be removed in some other way'

All sorts of devices have been invented in order to increase the intrapleural pressure and so cause the lung to expand. These undoubtedly have their place in those cases where the adhesions are few in number and recent in formation so that they may yield readily to an increased pressure from without and the natural pressure from within the lung itself during respiration. One of my medical colleagues insists that any radical operation looking to a release of the lung from its adhesions is absolutely wrong, because he claims that as they contract they pull the lung nearer to the rib surfaces and so aid expansion.

Surgeons, however, who have had the opportunity of examining these cases as they occur upon the operating table, will recognize the fact that the lung can no more get away from these adherent bands than Gulliver could rise from the cords of the Lilliputians.

Von Bergman emphasizes the statement that we have all been taught by the physiologists, that if the opening in the pleural cavity is smaller than the diameter of the main bronchus the lung will again take part in normal respiration. His explanation of this is that the air will enter the lung during inspiration through the main bronchus with greater ease than through the opening in the chest wall, so that the collapsed lung is obliged to distend during inspiration. But if we agree to this statement, it is impossible for us to do any work in the pleural cavity which involves a larger opening than the diameter of the main bronchus, without having a collapse of the lung.

Dennis also says that the pleural surface is insensitive, since it is changed into the wall of an abscess cavity.

It is evident, therefore, that if we are going to make a success of any method of operating that calls for a re-expansion of the collapsed lung, it is necessary for us to invent either some method of operating in a vacuum, such as Sauerbruch's box, or prove that there is some way of bringing about expansion in spite of large openings in the chest wall, and in spite of the

These were the difficulties that confronted me in the beginning of my work. One of the earliest facts, however, that impressed itself upon me was that the statement in regard to the insensitiveness of the pleura was incorrect. It is perfectly true that under complete anæsthesia we do not get a response to an irritation of the pleura; but this is not true, even when the pleura is markedly thickened and covered with plastic lymph, if the anæsthesia is incomplete.

The next question that we had to determine was that of the elasticity of the pleura. If the generally accepted statements were correct, that the pleura lost its elasticity in consequence of the thickening and the inflammatory deposits upon its surface, one would be obliged to adopt the methods of Fowler, Delorme, or Ransohoff, and in those cases where success did not result from these methods recourse would have to be had to the Estlander or Schede method.

We were able to demonstrate very early in our experimental work that these facts were incorrect.

Having demonstrated that these preceding statements were true—that is, that the pleura in these cases was not insensitive, and that it was still capable of expansion—the difficulty which presented itself was the physiological statement that with an opening larger than the diameter of the main bronchus, the atmospheric pressure from without alone would be sufficient to keep the lung in a state of collapse, and in that way our efforts to fill the abscess cavity by a proper expansion of the lung itself would be impossible.

We soon recognized that this was true in all of our fully narcotized patients, and it was by working on these facts on

the living subject that we were able to perfect the method of operating that we have now employed for a number of years

The opening in the chest is made in the usual way, and should take in from one to three or four ribs, according to the size of the cavity and the difficulty of reaching the collapsed lung. In young children, one rib is usually sufficient, in adults, from three to four are necessary. The piece removed should be from $2\frac{1}{2}$ to 3 inches in length, and as a general rule the sixth, seventh, and eighth are selected. The pleura is incised, and the accumulated fluid is allowed to drain away gradually at first. In all of these cases ether is the anæsthetic of choice in my hands, for the reason that we can have the patient under complete anæsthesia until the ribs are removed, and the effects of the ether narcosis last longer than the other anæsthetics after stopping the administration. Before opening the pleura, the anæsthetic should be completely stopped, in order that if we get a sudden expansion of the lung by its breaking away from its retaining adhesions we may not get an overdose of the anæsthetic, and in order that during the remainder of the operation the patient may be gradually coming out from the effects of the anæsthetic. As soon as the fluid has drained away, the opening in the pleura is made sufficiently large to enable the operator to make a thorough exploration of the whole pleural cavity, and to accurately locate the position of the collapsed lung. If there are large masses of coagulated lymph filling the cavity or adhering to the pleura, they should be at once scraped away, using a curette if necessary. The finger is then swept upward if the lung is in the apex, until its margin is recognized and a separation of the adhesions is carried on in exactly the same way that we separate the adhesions in the peritoneum. If these adhesions are so firm that they will not yield readily to the sweep of the finger along the pleural surfaces, the lung should be raised and a curved periosteotome swept along the parietal surfaces until the adhesions are freed. During the progress of this manœuvre the sensitiveness of the pleura asserts itself, and the partially anæsthetized patient begins to cough with each

sweep of the finger over its surface. With each forced expiration, expansion in the lung is seen to take place, until when the adhesions are fully broken up the lung with its pleural covering will entirely fill the pleural cavity and even press outward through the operative wound. This is undoubtedly due to the healthy lung forcing a larger amount of air into the main bronchus than can escape through the partially closed glottis in the effort at coughing, so that the excess passes over into the bronchus of the collapsed side. In this way the healthy lung is used as an air pump to expand the collapsed one.

Some years after I had demonstrated this fact, Dr. A. H. Smith, of this city, told me that he had experimentally proven the same thing. He demonstrated it by taking two pairs of bellows to which he attached rubber tubes which were carried upward into a "Y," and this was in turn attached to a larger tube on which he placed a spring. If one pair of bellows was then emptied, air could be pumped from the other and escape without having any effect on the empty pair, so long as the lumen of the larger tube was of sufficient size to allow of the egress of the full amount of air. As soon, however, as the spring on the larger tube was allowed to compress it, so that the full bellows-full of air could not escape at each compression, the air immediately flowed back and expanded the collapsed pair of bellows.

If the lung, instead of being in the apex, is compressed against the side and attached to the diaphragm, I have found it advisable to loosen the diaphragmatic adhesions first. These are usually much heavier and more difficult to separate than those in the upper part of the cavity. Care must also be exercised to recognize the margin of the lung and the curve of the diaphragm, both of which are sometimes very difficult to do. As soon as the separation of the diaphragm is complete, the other adhesions, as a rule, can easily be broken up by the finger, care being taken, however, if the empyema is on the left side, when one reaches that part of the operation where the pleura lies over the pericardium. Here the operator feels each contraction of the heart, and can tell at once exactly how much

pressure he can use in separating this portion of the lung. As a matter of fact, I have never had any difficulty during this part of the operation. It does not seem to cause any disturbance of the heart, and does not offer any greater difficulties in the separation of the adhesions than any other part of the cavity.

As far as possible, the operator should try to keep in contact with the parietal pleura during the separation of the adhesions, to obviate the possibility of tearing the lung. Sometimes it is impossible to avoid tearing off the pleura over a circumscribed area, and I have not infrequently produced a pneumothorax during the operation. This, however, no longer causes me any anxiety, as the healing process soon closes the opening in the lung, and, as a matter of fact, I have been successful in closing several cases of pyopneumothorax and getting a complete cure by this method of operating.

One of the difficulties that caused me a great deal of worry in the beginning was the fear of tearing into the lung and having a severe hæmorrhage. I have, however, never had any difficulty of this kind in any of my cases where it was not possible to control the hæmorrhage very readily. In case of opening a vessel in some portion of the lung that is not directly under the field of observation, the operator should at once have the anæsthetist put back his anæsthetic and bring the patient under complete narcosis. The lung will then again collapse and the bleeding will either stop from this alone, or it can be found and controlled either by means of the Paquelin cautery or any other measure that may seem advisable. We have found that it is an aid in these cases to wash out the pleural cavity, sometimes two or three times during the course of the separation of the adhesions, in order to get rid of the blood clot that results from the oozing from the denuded surfaces, and to get rid also of the coagulated lymph that is set free during the course of the manipulation. This is always done by having hot saline poured into the wound from a pitcher—never from a metal douche or an irrigating bottle. In this way there is no increase in hydrostatic pressure, and the fluid poured in is washed around by the expanding lung and flows

out again through the free opening at each expansion. As soon as the lung is fully expanded, a drainage tube is inserted, the skin wound closed around the tube, and a voluminous dressing applied.

We found in the course of our work that it is impossible in these cases to use a *drainage tube of the old type*. It almost invariably—by its rubbing against the pleura of the expanded lung—kept up a constant pleuritic cough, another illustration of the fact that the pleura is not insensitive in these cases. Dr. H. D. Furniss, formerly house surgeon of the New York Post-



FIG. 1.—Drainage tube.

Graduate Hospital, while on the staff devised a tube to obviate this difficulty. This is simply a piece of rubber tubing with a flat piece of rubber on either end, made in different lengths to fit different thicknesses of chest wall. In appearance it is *very similar to a spool*. The *smaller flange of this tube rests* against the inner wall of the chest, while the outer and larger flange rests upon the skin and prevents the drainage tube from falling into the pleural cavity.

The after treatment of these cases is conducted in the same way that is usual in other cases of empyema. A spirometer is useful in keeping up the full expansion of the lung, and with children the small rubber toys made to blow up help materially with the subsequent pulmonary gymnastics.

I have now operated on 225 cases by this method. Only those cases where the history was complete have been included in these statistics. Of these, 97 were cured and 58 were improved. Of the 58 improved cases, 40 were referred to the dispensary for dressing, and the great majority of them were completely cured; 9 were sent to the summer home; 9 were transferred to the Health Department hospitals. One of these

died some time after being taken home, the particulars are not known. Seven cases have been operated upon a second time, and in these it is surprising to find how thoroughly the lung has remained in full expansion. In one, an adult, operated upon some years ago for a very extensive empyema, a second operation was necessary because he lost his drainage tube into his pleural cavity. In order to reach these tubes it was necessary to separate the adhesions on each side of the sinus where they had been lying, the pulmonary and the parietal pleuræ being in contact everywhere excepting at the point where the tubes had rested.

There have been 47 deaths or 20 per cent. This of course includes the deaths from all causes and for all periods of time after operation. The causes of death were

Nephritis suppression of urine and turpentine poisoning	1
Nephritis alone	1
Tuberculosis	3
Pyæmia 19 days	2
Enteritis and pneumonia	1
Attack of vomiting 3 weeks after operation	1
Pneumonia both sides	2
Collapse on opening chest	1
Diphtheria	3
Volvulus	1
Empyæma and abscess of lung	8
Shock	8
Exhaustion from 2 to 42 days	22

If we take into account the cases dying within one week of the operation, as due to the effects of the operation itself, we get 15 cases. The others in the above list, in all probability would have died under any method of operation.

The length of time the patients have remained in the hospital has varied from 6 to 42 days an average of 29 days.

In children under 18 months of age the mortality is very much higher than in older patients.

The shock following this operation is distinctly less than in the other operations for chronic empyæma. Within two or three days the patients are able to sit up, and they are usually out of bed within a week.

CYSTS OF THE OMENTUM.

BY RUFUS E. FORT, M.D.,

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A female child, two and a half years old, was presented February 21, 1906. She was fairly well nourished and gave history of no illness except two attacks of acute indigestion, each lasting several days. Abdominal enlargement was noticed eighteen months before by her mother. This had progressed until child now had an abdominal circumference of twenty-eight inches at the umbilicus. General health and nourishment had been very good, with no symptoms referable to the abdominal condition, except some dyspnœa upon exercise.

Examination revealed the following physical signs, great abdominal distention, abdominal veins prominent, complete dullness upon percussion over entire abdomen. Not a resonant note could be found anywhere. Fluctuation and a decided thrill wave could be elicited at any portion of the abdomen. Pulse 100°, temperature and urine normal.

The enormous abdominal distention led me to the conclusion that gradual relief of the hydrostatic pressure upon the splanchnic vessels offered the safer course. Consequently, on February 23, five pints of dark bloody fluid were removed by aspiration. In five days examination showed some decrease in the size of the abdomen from the time of the aspiration.

The abdomen was opened through a median incision, extending from above the umbilicus upward. There presented at once a dark glistening tumor, having the appearance of a distended gangrenous intestine, which, owing to its flaccid condition, was delivered through the incision without rupture. It was found to be a collection of fluid in the folds of the great omentum, extending from under the pylorus on the right along the greater curvature of stomach, to and including the folds of the gastro-splenic omentum. A chain ligature of catgut was applied from right to left, including the omentum and the gastro-splenic ligament. There were no adhesions, so the work was rapidly

accomplished The abdomen was closed Recovery was uncomplicated and the child left the hospital well in two weeks

Closer observation of the specimen shows the absence of a distinct capsule the fluid being between the folds of the omentum There was an absence of fat in the omentum but the vascularity of the omental wall, as would be expected, was great, Closer inspection showed the stab of the aspirator five days before had not closed but continued to leak, this accounting for the decrease in the abdominal measurements, from day of aspiration to the day of operation There was, however, no free fluid in the peritoneal cavity, the absorption having been quite in proportion to the leakage

The fluid had a specific gravity of 1.007 and contained albumin and many degenerated blood cells

In reviewing this subject we find it first described by Gairdeur¹ in 1851 Subsequently I have collected twenty one cases The case which I have reported, so far as my investigations have gone, will make the twenty second case

The three points which have impressed me most are First, the impossibility of diagnosis without exploration, second, the condition is seen most often in children under ten years, 50 per cent under ten—65 per cent under twenty, which leads us to the belief that it is of congenital origin, and third, it occurs more frequently in females, 75 per cent

Jacobi² states that perhaps all of these tumors are of lymphatic origin and result either from dilatation of the lymph vessels or from cystic degeneration of the lymph nodes He submits this as Rockitansky's idea however, and offers no further evidence The histologic characteristics of their encapsulation and the contents of these cysts, however, are of such a variety, that it is hard to believe that a distinct etiologic factor can be arrived at Lymph, chyle, serum, both with and without blood cells, have all been reported Two dermoid cysts have also been reported, Waldy³ and Spencer Wells⁴ reporting such cases

The presence of a distinct capsule within the folds of the great omentum has been observed but in a majority of cases,

we find the tumor separating the folds of the great omentum with no other encapsulation. Again we find the tumor with a distinct capsule, not within, but attached to the omentum by thin ribbon-like bands. This leads Phillips⁵ to suggest that they find their origin in the ovary, subsequently becoming detached by twisting of the pedicle, and continuing life by attaching itself to the omentum. The same question presents itself to Jessett,⁶ but he admits his position is not tenable, by stating that the large vessels passing around the entire cyst came direct from the omental vessels.

Jacobi⁷ believes that it will always be a question whether the hyatid omental cyst originates in the liver or in the omentum.

Marsh and Monserrat⁸ report a case of a child, less than two years old, with a large cyst with a distinct capsule showing externally an endothelial covering and covered internally by a coat of fine connective tissue with numerous blood channels, the connective tissue coat being represented by a marked layer of fibrous tissue. There was great vascularity of the cyst wall, which he suggests as being evidence of the traumatic or inflammatory origin of the condition; but this case had been repeatedly aspirated, and I assume that trauma and local peritonitis from aspiration could have produced the same condition.

The case reported by Hearne⁹ furnishes the most convincing proof of the congenital origin of these neoplasms. This was a case of a boy, age eight, in which he obtained a distinct history of a fluctuating tumor at birth, which decreased in size for some time, after which distention became apparent. It was aspirated at the age of four but refilled and was removed four years later by Hearne.

Cotman¹⁰ reports a most interesting case of a young lady, age twenty-one, who received an injury by being thrown violently against the shaft of a cart, upon whom he operated three months later. The omentum was curled up under the posterior portion of the greater curvature of the stomach with a cyst connecting with a perforating wound of the posterior portion of its pyloric end.

This is the only case reported which has a distinct history of trauma, and the symptomatology in this case is also unlike the remaining cases. There were repeated attacks of collapse, vomiting, continued pain, and altogether a clinical picture much graver than we find in the other reports.

The youngest reported case is the one reported by Schramm,¹¹ a child one year old. This patient's abdomen measured thirty and one-half inches in circumference. A dark grumous fluid was within the folds of the great omentum.

A case reported by Young,¹² of London, in physical characteristics, is identical with the case which I have just reported.

Symptomatology—It is rare that these tumors are discovered in earlier stages of their development. Pain is not usually an accompaniment, and when it is present it is not severe in character, and is usually attributable to digestive disturbances, though several observers have noticed that the radiation of pain was usually toward the liver. It has also been observed that during pain there are marked digestive symptoms. Anorexia, dyspepsia, vomiting, diarrhoea alternating with constipation and even cachexia.

The costal type of respiration and severe dyspnoea have also been observed. Hahn states that the special symptoms of tumor of the omentum present an extraordinary analogy to those of movable kidney. I can see that this may be true in those cases in which we have a disturbing symptomatology, but in the case of my own, as well as in others, there was an absence of subjective symptoms sufficient to point to any diagnosis. It is evident, therefore, that omental tumors present no characteristic symptoms and the clinical picture is that which accompanies all other forms of cystic abdominal growths.

This is emphasized by the fact that the omentum possesses no physiologic function other than a covering membrane. Therefore, it is most natural that small tumors will produce no symptomatology, and that symptoms will only be produced when the weight of the tumor produces dragging or when pressure symptoms occur.

Diagnosis—No case has yet been reported in which the

diagnosis has been positively and accurately made. The condition has been diagnosed as ascites, lipoma, aortic aneurism, hydatid cyst of the liver, pancreatic cyst, cyst of the urachus, tubercular and encysted peritonitis.

Pean mentions three points as pathognomic of omental tumor. First, superficial location, second, abnormal passive mobility with downward limitations, and third, absence of functional disturbance, to which Anganeur adds that respiration has little or no effect on the position of the tumor, and Witzel has noticed movement of the tumor with intestinal peristalsis.

I conceive that in the earlier stages of this condition, where there has been an absence of an inflammatory process, consequently an absence of adhesions to the adjacent viscera, that these points may be of diagnostic value, but the rare occasions on which we will see these tumors in this stage, I fear, give but little practical value to their suggestions. This is proven by the fact that Pean, as well as others, have failed to make the diagnosis.

Palpation.—Palpation reveals an elastic growth with fluctuation. The thrill wave is present and dulness is absolute over entire tumor on percussion. This shows its cystic nature and that it is anterior to the hollow viscera. Lipoma is the only solid tumor with which it may be confounded, fluctuation having been elicited in this condition.

Differential Diagnosis.—The superficial location may simulate neoplasm of the abdominal wall, lipoma, though lipoma is usually fixed. It occurs almost always in adolescence and there is an absence of pressure symptoms.

Pancreatic tumors are usually malignant, productive of constant pain, usually produce icterus, fatty stools, and rarely occur before middle life, and, as a rule, coils of the intestine yielding a tympanic note may be found over the tumor. Cyst of the urachus, though rarer than omental cyst, if seen early, its origin may be observed to be lower and its mobility is less marked and the same in all directions.

In cyst of the mesentery we usually have a coil of intes-

tine anterior. Ovarian cyst in their earlier stages may be differentiated by pelvic examination and by the physical signs, showing that the tumor springs from the lower zone of the abdomen

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TUBERCULOSIS OF THE BLADDER.

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(Continued from page 283.)

PART II.

DIFFERENTIAL DIAGNOSIS.

The symptom complex, progressive increase of frequency and pain in micturition, pus and tubercle bacilli in the urine with occasional blood at the end of urination, occurring in a patient, in the absence of any other definite cause, is strongly suggestive of tuberculosis of the bladder. All of these symptoms, however, may be met with in the absence of any bladder lesions, in tuberculosis of the kidney or of the prostate. Hunner cites several instances of tuberculosis of the kidney which presented only bladder symptoms, whereas cystoscopic examination proved the bladder to be free. The only positive sign, is the appearance of the mucous membrane as seen by cystoscopic examination or through an artificial opening.

Bladder tuberculosis is to be distinguished from tuberculosis of the kidney, tuberculosis of the prostate, simple ulcer, various types of pyogenic ulcerations, pyogenic cystitis and new growths.

Over and over again *tuberculosis of the kidney* has been mistaken for disease of the bladder, for the reason that the kidney process very often in the early stages shows itself mainly or entirely through bladder symptoms—frequent or painful micturition, etc. This distress is induced reflexly from the kidney, or by irritation of the urine, and is not due to lesions of the bladder mucosa. A careful inquiry into the history will usually bring to light the fact that the patient has suffered at some time from pain, or other sensations referable to the affected kidney; and a careful palpation of the renal region will generally show physical signs, enlargement, rigidity of the

muscles and tenderness. Frequent and painful micturition, accompanied by blood at the end of the act is very strongly suggestive of bladder implication, but the only positive information is to be obtained by cystoscopic examination.

In *tuberculosis of the prostate* with extension to the posterior urethra, there is much local discomfort and great bladder tenesmus. In such a picture we have three considerations to help us, first, rectal examination may point to implication of the prostate, but does not exclude the bladder, secondly, the first specimen of urine voided may be comparatively free from pus, while the last is very cloudy, this, however, is suggestive of implication only of the prostate, without disease of the bladder.

Simple ulcer of the bladder is a well known but an infrequent condition. When the lesion is situated near the trigone, many of the distressing local symptoms of bladder tuberculosis are produced. Here we must rely on the absence of tubercle bacilli from the urine, the absence of tuberculosis elsewhere in the body, and the difference in the cystoscopic picture. A simple ulcer as seen through the cystoscope is usually circular the edges are fairly smooth and regular and are not undermined, the base shows a red and firm granulation tissue, and the surrounding mucosa presents no evidence of tubercles.

In *ulcerations* due to the various forms of cystitis, the appearance is very different from that of tuberculosis. The inflammation of the mucosa is very much more extensive, the ulceration is more superficial and occurs as small areas scattered here and there over the inflamed mucous membrane. There are no tubercle bacilli in the urine and the other organs are free.

Stone has occasionally preceded the development of tuberculosis and has very frequently complicated it, in such instances it is of course impossible to arrive at a differentiation by means of the ordinary objective symptoms. As a rule a calculus does not produce the extremely distressing, frequent, and painful micturition that belongs to tuberculosis, the frequency is less at night, is alleviated by rest and exaggerated

by exercise. All doubtful cases should be examined through the cystoscope.

Acute pyogenic cystitis presents a symptom-complex similar to that of tuberculosis, but should never be mistaken for it; for the one is relieved in a short time, while the other persists. Chronic pyogenic cystitis never gives rise to symptoms of such an intense degree as does the tuberculous inflammation.

Papilloma occasions less bladder disturbance, causes less pus in the urine, and produces more profuse and more continuous bleeding.

Carcinoma is seen in older patients and is not attended by the same distressing symptoms until a later stage, when a diagnosis can be made from other signs.

MEANS OF DIAGNOSIS—*Cystoscopy*.—When it is considered how little can be done for such a tuberculosis, even after a diagnosis is made, and when it is realized that a slight trauma may prove a source of danger by allowing an infection to occur, or by furthering the extension of one already present, the advisability of the introduction of a cystoscope seems questionable. But, on the other hand, when the need of finding out the exact state of the kidneys, and of determining the presence and extent of disease in the bladder so as to more clearly settle the question of operation is fully appreciated, all objections are removed.

Cystoscopic examination, owing to the diminished capacity and the extreme irritability of the bladder, is often unsatisfactory and occasionally impossible, but a patient and a careful trial will in most instances be amply rewarded. The method which I employ is as follows: When possible the patient is given 1 gramme of cystogen every three hours for 12 hours before the examination and directed to drink an increased amount of water. When the bladder is very irritable, a hypodermic injection of $\frac{1}{4}$ gr. of morphin is administered half an hour before the introduction of the cystoscope. The genitalia are cleansed with warm water and soap and washed with a 1-1000 bichloride solution; the urethra is irrigated with 500 cc. of sterilized salt solution; the penis is then wrapped

with a sterile piece of gauze, the glans not being covered. One ounce of a 4 per cent solution of cocaine is then injected into the urethra by means of a blunt-pointed syringe (the cocaine solution must not be sterilized, but the crystals are put in a sterile bottle and dissolved in sterile water), this is retained for 5 minutes, the meatus being grasped with two fingers. Such an amount of cocaine would seem to be large, but I have no hesitancy in injecting even more, provided there are no recent abrasions of the mucous membrane which have been made by the introduction of instruments. Next, a previously boiled silk catheter with a prostatic curve, lubricated with sterile glycerine, is introduced into the bladder, and the organ very carefully washed out by injecting and immediately allowing to flow out 20 to 30 cc of sterilized water. These washings are repeated until the liquid returns clear. One hundred and fifty cc of sterile water are then injected into the bladder, provided it will tolerate that quantity, if not, the viscus is filled to its capacity. If less than 100 cc is all that can be retained, the examination is not satisfactory, and if less than 60 cc, nothing definite can be seen.

In obstinate cases which will not tolerate sufficient fluid, I first inject 1 oz of a 4 per cent cocaine solution and then fill the bladder with a 2 per cent solution. In this way I have been able to inject sufficient fluid to give a fairly satisfactory inspection. Where there is any bleeding I use from $\frac{1}{2}$ to 1 oz, of a 1-2000 solution of adrenalin.

Tubercle Bacilli—The method which I have lately employed for the detection of tuberculous organisms is as follows.

Procure if possible a catheterized specimen, if this is done with ordinary precaution, we can be reasonably sure of avoiding contamination with smegma bacilli. When the use of the catheter is not feasible, I thoroughly cleanse the gland with soap and water and then wash it with a 1-1000 bichloride solution. The patient is then directed to urinate and the first half of the urine is thrown away, the second half is caught in a sterile conical glass and put aside for four hours to settle, the supernatant fluid is poured off and the remainder centrifuged.

galized. In females, in order to avoid contamination by smegma bacilli, it is always necessary to use the catheter, for it is much harder to cleanse the urethral orifice thoroughly than in the male. Young and Churchman have found that by thoroughly irrigating the anterior urethra in males before urination smegma bacilli are entirely eliminated. After the urine has been thus prepared the sediment is taken out with a clean pipette and one drop put on each of 4 slides; these slides are then adjusted on an iron ring some distance above a Bunsen burner, care being taken to have them high enough to prevent too intense a heating, and are allowed to remain until the fluid has evaporated and they have become perfectly dry; they are then passed lightly through the flame, placed again on the ring, and the smears are well covered with carbolfuchsin solution. The flame then is passed backward and forward under them, so that they become hot enough to give off vapor, but not sufficiently so to boil; this heating is kept up for four minutes, fresh fuchsin is added from time to time, and the specimens are carefully watched to prevent evaporation; they are then removed, washed lightly in running water, and immersed in Gabbet's methylene blue, where they remain until all of the red color has disappeared. There is no danger of decolorizing the tubercle bacilli, if they have been well stained with the red. The usual instruction, of applying the Gabbet's solution for from one-half to one minute, I disregard entirely, and am governed only by the disappearance of the red color. The specimens are then washed again, the excess of water is removed with blotting paper and ordinary xylol poured on and allowed to remain for two or three minutes; after this immersion oil is quickly applied before the specimen has had time to dry.

In the examination I use a mechanical stage, and go over the whole field in four or five slides. If these precautions are carried out, tubercle bacilli will be found in every instance of bladder tuberculosis.

For directions, in case it becomes necessary to differentiate between smegma bacilli and tubercle bacilli, I refer the reader

to my former paper on renal tuberculosis. Several observers have stated that smegma bacilli are somewhat broader than tubercle bacilli, are arranged in smaller clumps, and scattered more evenly and more numerous throughout the field, whereas the others are more slender and are seen in crescent-shaped masses. In ammoniacal urine the tubercle bacilli take the stain with some difficulty and are more readily decolorized; in some instances they cannot be stained, but this is very exceptional.

Tuberculin.—The use of tuberculin is a moot question. Two cases have been reported in which it rendered a latent bladder tuberculosis active; another, in which it increased the progress of a renal tuberculosis. Morelle cites an instance in which an intractable tuberculous cystitis was lighted up, after an injection of tuberculin given to determine the presence or absence of disease in the lungs. Baumler records a case of tuberculosis of the kidney and bladder which were made very much worse by its use. Roux saw incontinence of urine, hemiplegia, and aphasia develop after two injections for a tuberculosis of the prostate.

Many experimental injections into animals have proved that the toxin has a baneful effect on the kidney epithelium. On the other hand, there are numerous eminently qualified and careful clinicians who assert that it has no injurious effect, and T. Warren Brown and Schröder have reported two cases in which its use seemed to be beneficial.

Wright and Douglas have proved that tuberculin T. R. in sufficiently large doses to produce a decided reaction is harmful. I think, therefore, that this work stands as evidence against its use for diagnostic purposes.

In consideration of these possibilities, and knowing that it is comparatively easy to make a diagnosis by other means, I do not think that tuberculin should ever be given.

Cryoscopy.—The determination of the freezing point and the molecular concentration is of no service in tuberculosis of the bladder. The same may be said of the administration of phloridzin, methylene blue and other drugs.

PROGNOSIS.

A few, but very few, cases of tuberculosis of the bladder heal; a minority run a chronic course, extending over a number of years; but in the majority the progress is more or less rapid and the downward course is marked by few interruptions. The symptoms tend to increase in severity and the terminal months are attended by an extreme suffering which is hardly equalled in any other disease. The process is prone to destroy the bladder and to spread to other organs. The average duration of life, after the disease has become established, is somewhere in the neighborhood of 35.05 months.

It is certain that the disease may heal either spontaneously, or as a result of surgical or hygienic treatment. Personally I have not seen such an instance, but the character of the observers places their statements beyond doubt. Haenens watched a tuberculous ulcer for 2 years, and noted its final healing; Stoeckel in a careful study with a cystoscope has seen both tubercles and tuberculous ulcers clear up; Cumston, Strauss, Motz, Hallé, and Battle have observed similar results. These records, together with a number of others, in which are noted the disappearance of bladder lesions after nephrectomy, prove beyond doubt that it can occur. In my collected series of 416 cases, there were 29 cases reported as cured; I have excluded as far as possible the doubtful ones, but I have been compelled to include some others about whose nature I was not thoroughly convinced.

But surgical and medical measures applied directly to the bladder (except the complete removal of the focus) have in the majority of instances no effect; indeed in not a few they are harmful; the disease, in spite of, or by the aid of, these interferences, tends progressively downward, and the patient finally succumbs to general tuberculosis, or is worn out by the frequent and painful micturition. Hygienic treatment—change of climate with proper care and appropriate food—offers by far the best chance for recovery.

So far as the bladder condition itself is concerned the

ulcer usually confines itself to the mucous coat, but occasionally it perforates the bladder wall. The disease process inclines very early to extend from the bladder to the prostate and vesicles, but only very exceptionally does it ascend to the kidneys. Formerly an ascension was thought to be very common, but now it is known to be extremely rare, in order that it may occur, there must be some underlying pathological condition, which allows the tuberculous urine to regurgitate along the ureter, and remain in prolonged contact with the mucosa of the pelvis. Lewin and Goldschmidt have concluded, from experiments on rabbits, that a certain regurgitation happens during contraction of the bladder when the viscus is about half filled. These experiments have not been confirmed by others, but even if such a regurgitation does sometimes take place, the urine quickly returns into the bladder.

The tendency of bladder tuberculosis to spread and form general miliary tuberculosis, cannot be definitely estimated, but does not seem to be great.

TREATMENT

A study of those cases of tuberculosis of the bladder which I have seen, and a careful analysis of the reported instances, force me to the conclusion that, with the exception of *hygienic treatment and the complete removal of the focus*, there is very little to be done for this malady. Drugs have no good effect, and other direct surgical treatment seems to do little good and frequently much harm. Nevertheless, it may be as well to pass in review the various medical, hygienic and surgical measures that have been recommended.

Medical Treatment—The agents which are recommended for internal use are guaiacol, iodoform, cod liver oil, arsenic, ichthyol, and not a few others. There is very little evidence to prove that these have any effect on tuberculosis of the bladder, and personally I believe that they are all useless. Diuretics and urinary antiseptics, such as urotropin and salol, may mitigate secondary infections, but on tubercle bacilli they have no influence. The cases which have been reported as cured by medical treatment would probably have recovered without

it; the medicine, so far as the cure was concerned, was more co-incidental than causative.

Tuberculin.—This agent has been used in numerous instances, in most of them without benefit; two patients, however, the synopses of whose cases are given below, showed decided improvement: T. Warren Brown reports the case of a female of 16, who had undoubted tuberculosis of the bladder as evidenced by the presence of tubercle bacilli in the urine and tuberculous lesions in the bladder. After three months' use of Koch's T. R., there was decided alleviation of the symptoms, and the ulcers in the bladder had undergone retrograde changes. The second case, recorded by Schröder, was that of a female, aged 39, who suffered from great vesical distress, had tubercle bacilli in the urine, and characteristic ulcers in the bladder. Tuberculin T. R. was used for five months; the patient improved very much and gained in weight, but later she had a recurrence.

The very recent and extremely suggestive work of Wright and Douglas on the control of the administration of tuberculin T. R. by using the tuberculo-opsonic index may prove of great value, but as yet the method had not been sufficiently used to determine its clinical value, although the improvement which has been noted by Wright in some cases of tuberculosis of the bladder appears very promising.

Pardoe has used tuberculin in very minute doses, not sufficiently large to produce any reaction. He agrees with Wright and Douglas that the reactive doses are harmful. He has treated several cases of bladder tuberculosis with marked benefit. A few patients, he states, were practically cured.

Hygienic Treatment.—A suitable climate, plenty of good air and sunshine, combined with good food, go farther toward combating bladder tuberculosis than any other agents at our command. The same climates that are of use in pulmonary tuberculosis are equally serviceable in this form of the disease. I usually recommend patients with means to go to the Adirondacks for about two years; others, who are obliged to earn a livelihood, I send to Colorado, California or New Mexico.

The recent observations of Halsted on the beneficial effects of out door life on joint and other forms of surgical tuberculosis are very encouraging and give us reason to hope that many cases of genito-urinary tuberculosis will be similarly benefited

As much well selected food as the patient's digestion can stand should be given, eggs and beef forming the base. Milk, which is so valuable in kidney and bladder diseases and which forms a large part of the diet in pulmonary tuberculosis, should be taken in bladder tuberculosis more sparingly, for the imbibition of fluid necessitates more frequent urination and consequently more bladder irritation. In general, then, sufficient liquids to carry on the proper body metabolism should be allowed, but more than this may prove injurious.

Surgical Treatment—Suprapubic opening of the bladder, combined with curetting, cauterization, or excision, complete removal of the bladder, perineal section, curetting and cauterization through the urethra in the female, cauterization through the urethra in the male, artificial vesico vaginal fistulæ, irrigations and instillations, removal of the primary focus (nephrectomy, nephrotomy, castration, prostatectomy, and prostatomy), and resection of the nerves for relief of pain, are the measures which have been proposed to combat bladder tuberculosis.

Suprapubic Cystostomy—The first suprapubic opening for tuberculosis of the bladder was done by Guyon in 1885, three years later Poncet after doing a cystotomy sutured the bladder wall to the abdominal wall in order to prevent healing. The technique of this operation is difficult, for the reason that the bladder by its contraction is drawn well down into the pelvis and can be only slightly distended. To partly overcome this hindrance and force the bladder toward the suprapubic region, Peterson devised a rubber bag which is placed in the rectum and distended. This apparatus is a valuable adjunct, but it should be used with care since two ruptures of the rectum have been recorded after its use.

The uses of the suprapubic opening are. First, to drain

the bladder and relieve the distressing symptoms; second, to allow of the use of measures against the disease process, excision, curetting, cauterization (by heat or chemicals), the application of remedies (such as iodoform) which are thought to be anti-tuberculous.

A cystostomy for the relief of symptoms is usually employed in the late stages when the patient is being worn and harassed by frequent and painful micturition; in such a state a suprapubic opening is most urgently demanded and is followed by immense relief, but that the opening and drainage have any distinctly beneficial effect on the disease is doubtful. A great many cases have been reported as improved, but it is probable that the beneficent influence was induced by the relief of symptoms rather than by the betterment of the actual disease.

Secondly, to attack the disease. When we study tuberculosis of the bladder by cystoscopic examination, or by observation after death, we find that, while gross lesions appear to be more or less circumscribed and superficial, careful inspection shows that in the large majority of cases the process is widely scattered over the mucous membrane and that the ulceration is often deep. Looking these facts squarely in the face, and realizing their full significance, the utility of trying to remove the diseased area would seem very questionable. What is really done in most cases, when this is attempted by curetting, is simply a partial scraping of the ulceration and a consequent wounding of the surrounding mucous membrane, with the possible scattering of the disease in the abrasions so made. This has been proved by a number of observations in which tuberculous granulations have sprung up extensively just after the operation. In order to study this subject more fully we will take it up in detail.

Excision of the Mucous Membrane.—I have records of this procedure 13 times; twice with complete removal of the whole mucous membrane of the bladder (Brohl and Bardenhauer) and three times with the resection of the portion of the bladder wall. Ten of the cases were followed by death

at varying intervals, one was not improved (Greiwer), two were improved (Greiwer, Matile) Brohl's and Bardenhauer's patients died some time afterwards. Young removed a section of the bladder in a case of tuberculosis of the seminal vesicles, the patient lived for a few months and died from general tuberculosis. Cushing excised a part of the bladder carrying a tuberculous ulcer, the patient developed cerebral complications, probably emboli, and died in a few days. Kelly in a number of instances has taken out a section of the bladder in conjunction with a nephrectomy, the immediate results in the majority were good, the ultimate reports I have not obtained. Delageniere excised all of the mucous membrane of the trigone and several areas from the bladder wall, the patient rapidly died of tuberculosis of the lungs. The results, therefore, of excision are not encouraging, in the twelve collected cases there were no cures and only two improvements.

The Paquelin Cautey—Cauterization by heat was first practised by Guyon, since which time it has been frequently repeated, it has the advantage over curetting that it does not wound the surrounding mucous membrane, and that it does not scatter the disease, but it must be remembered that there is a very marked reaction from the burning, and that there is a large enough slough to be thrown off which produces a lowered resistance and invites extension.

Cauterization by Chemicals—Chloride of zinc, carbolic acid or nitrate of silver, may be of some utility, but when we consider that their action is at best superficial, that they do not penetrate deeply, and that they are followed by the production of necrotic tissue which entails sloughing and its consequences, we see that their use is not without certain disadvantages.

Iodoform Applications—Iodoform possibly has some anti tuberculosis effect, but has not fulfilled the promise which it gave at first. Guyon believes that it does not influence the growth of tubercle bacilli, but that it neutralizes their toxins. Nothing has been brought forward in the way of experiment to prove this point.

Results of Suprapubic Cystostomy.—In 119 suprapubic cystostomies there were 9 cases reported as cured, 48 as improved; 34 cases were reported as not improved, 27 as showing late deaths, and 1 operative death. The wounds were kept open for variable periods. Powers records one in which the bladder was drained for five years and the patient regained his former health. Bandler in a female kept the sinus open for three years, and the patient remained moderately well. In a number, a second operation was performed to close the fistula; there are eight recorded instances in which it remained open in spite of these efforts.

Desnos did a suprapubic cystostomy with complete excision of the diseased area; five weeks later the fistula showed tuberculous granulations and the bladder was nearly filled with them; the patient succumbed in 8 months. The same author has observed two other analogous cases. Matile reports a case in which the fistula closed and then broke down with granulations apparently tuberculous. Johnson did a suprapubic cystostomy and made a vesico-vaginal fistula; the suprapubic wound was allowed to heal and the vaginal wound kept open; the patient's health was completely restored. A Johns Hopkins Hospital patient, upon whom a suprapubic cystostomy was done, was wearing a drainage apparatus at the end of three years and reported very little local discomfort and good general health. Scherb in 12 suprapubic cystostomies with curetting had only one good result; some of the other patients improved, but only temporarily.

Loumeau reports 12 suprapubic cystostomies; 3 of the patients were cured, 8 were improved, and 1 died. These are included in the above statistics, but I am constrained to have some doubt about them for the reason that the percentage of cures is so high. In striking contrast with this are the results from Guyon's clinic as reported by Banzet; there were 13 suprapubic cystotomies; 7 of the patients died soon afterwards, 3 were not improved and had to submit to other operations, 5 obtained a passing benefit and 1 was very much improved; this last case is placed in my cured list, for it was

stated in a report made by Guyon that the patient was practically well

Personal observation of the cases in my private practice and those which I have seen in hospitals, together with a study of the literature, convinces me that a suprapubic cystotomy should be done principally for the relief of symptoms, and rarely with the idea of removing the tuberculous area. It may be urged that in the above list the number of improved cases and the cured ones do not justify such an assertion. To this it can be answered that the cured instances of undoubted tuberculosis of the bladder are very few, fewer even than my statistics might indicate, for I have included some reports which to me were doubtful. In regard to the list of betterments, a following up of the patients will show that the amelioration is brought about usually by the immediate and great relief from the terribly distressing, painful, and frequent micturition, this riddance allows the patient to sleep and eat and become, therefore, generally better, but I submit that the disease in the large majority continues to progress.

Perineal Section—Philip in 1803 did the first perineal section for the relief of painful cystitis. He was followed in 1806 by Blizzard and Guthrie. Thompson some time later improved the technique of the operation and brought it more into popular favor, several years afterwards it was further modified by Guyon. The first section of this kind for tuberculosis of the bladder was done in 1885 by Boursier.

In a collection of 26 perineal sections in my list 10 of the patients died, 1 was nearly cured, 5 were improved, 2 were unimproved, 2 were made worse, in 6 cases no results were given. In the 10 deaths, there were 2 patients who died from the effects of the operation—probably from peritonitis (Deltheil and Clado). While only two cases were reported to have been made worse, from the description of the patients after the operation, it is to be supposed that there was a larger number. Tédénat reports an instance in which military tuberculosis followed perineal section. Bryson had one case in which the wound filled with tuberculous granulations, and later ulcera-

tion into the rectum occurred. There were a number of others in which the wound became tuberculous and the sinus failed to close. Guyon reports 7 perineal sections; 6 of the patients receiving some benefit, but none being cured.

If there is an extensive tuberculosis of the prostate (prostatic abscess, etc.) perineal section is indicated, but for simple drainage or treatment of a tuberculous bladder, it is questionable if it ever should be done. The principal objection to it is that it necessitates a deep wound and it exposes various tissues—prostate, urethra, muscles—to infection by tubercle bacilli. Unless for a definite reason, perineal section should never be the operation of choice.

Entire Removal of the Bladder.—This has been carried out twice for tuberculosis. Both patients died within a short time. It is needless to say that an operation of such magnitude should never be performed when it is impossible to remove all of the diseased foci. This being the case in tuberculosis of the bladder, such a procedure is little less than criminal.

Removal of the Primary Focus.—This, in my opinion, is the operation which offers the best results from surgical interference. It is certainly the most rational procedure, for we have seen that bladder tuberculosis is practically never primary, that the organ withstands the presence of tubercle bacilli for a long time, that it becomes infected only after its resistance has been lowered, and that it tends to heal when freed from the infecting focus. Removal of the focus includes the following:

Nephrectomy.—In 19 nephrectomies, there were 5 deaths and 9 cures; the results in 5 were not given. There were many other patients who showed improvement of the bladder after removal of the kidney. These were collected in a former list of cases of renal tuberculosis and are not included in the present bladder series. It may be stated, I think, without question, that a mild infection of the bladder will heal after and that a more extensive one will be benefited by a nephrectomy.

Nephrotomy.—In cases of tuberculosis of the bladder in which nephrotomy was done, there were 2 deaths, 2 patients

were improved, and 1 was possibly cured (the kidney also healing) As there are only a few instances of tuberculosis of the kidney which have been cured by nephrotomy, the percentage of bladder recoveries must be very small

Prostatectomy—Up to the present time there have been so few tuberculous prostates removed from patients who were suffering also with bladder tuberculosis, that the general influence of such removal on the morbid process in the bladder is not known It has not been considered right heretofore to excise a diseased prostate when the bladder also was involved, I am not thoroughly convinced that such conservatism is wise and intend to discuss the question more fully in a forthcoming paper.

Prostatotomy—This is usually an operation of necessity brought about by the presence of an abscess There are some patients in whom the bladder was probably implicated, who experienced great alleviation of the symptoms and improvement in health after prostatotomy, but I have not been able to find any case with sufficiently clear bladder records to enable me to form conclusions as to the ultimate influence of the procedure It would seem reasonably certain that simple incision of a prostatic tuberculosis would be beneficial only when all of the diseased tissue had broken down into a softened mass and could be evacuated

Removal of the Seminal Vesicles—These organs have been excised for tuberculosis more than 40 times, but in these instances there was no report as to the bladder implication

The results of the operation, therefore, in so far as the bladder was concerned, cannot be given

Removal of the Testicles—As I have not thoroughly reviewed the literature on tuberculosis of the epididymes, and have seen only a few cases in which a double castration was done in patients who were suffering also from bladder tuberculosis, I cannot state with exactness the effect which such a procedure has on the bladder, but from a general review I believe that removal of both testicles, when they contain the primary foci, has a beneficent effect on disease of the bladder

Vesico-Vaginal Fistula.—Emmet in 1861 was the first to make a vesico-vaginal fistula for tuberculosis of the bladder. This operation has been practised extensively, but mainly upon patients who demanded relief from painful and frequent micturition. According to the reports many patients improved, but none, so far as I could find, were cured. Johnson records a complete restoration of health while the fistula remained open, but presumably the symptoms returned when it closed. Kelly and Hunner have had a few excellent results from it, but lately they have not practised it so much as formerly. The good effects of this operation are due mainly to the relief of the distressing bladder symptoms; further than this it has no influence on the disease.

Curetting Through the Female Urethra.—There were 17 cases recorded; 10 of the patients were unimproved, 5 were improved, and 2 were cured.

Out of the 10 cases recorded by Banzet, in 8 there was great improvement; the pain became much less, in some cases completely disappearing, and micturition was not so frequent; 2 patients were not benefited. Camero in 14 cases had 5 patients who were permanently, 5 temporarily improved; in 4 cases the results are not given.

Cauterization with chemicals has been practised both with and without curetting. In this connection Wittzack recommended lactic acid; it was used at first extensively, but is now less and less employed. Nitrate of silver is not well borne and seems to aggravate rather than benefit the disease, although Stoeckel, Noble, and others have seen good results from its use. Chloride of zinc is the most popular.

Cauterization Through the Male Urethra.—This is accomplished by means of a cauterizing cystoscope. One such case has been reported by Schmidt in which a tuberculous ulcer was treated in this way; some improvement followed, but the later history is not given.

Resection of the Sensory Nerves.—This operation was proposed for the relief of very painful and obstinate cystitis. It was first done in 1896 by Simpson; two years later Rochet

brought it into more general notice. The procedure consists in finding and dividing the sensory nerves of the bladder which pass off from the third and fourth sacral trunks. If the whole nerve (third or fourth sacral) is divided, enervation of the tissues in the perineum and possibly the penis will result. The technique of the operation is very difficult, because the nerves are small, obscure, and deeply placed.

Instillations—Bichloride of mercury and iodoform have been extensively used, guaiacol, creosote, ichthyol, gemonol, and lactic acid have been occasionally employed.

Sublimate was first used in this manner by Jefsner in 1889, later it was recommended by Guyon, and has been used very widely by his students, in whose hands its use has met with considerable success, elsewhere, however, it has not received very enthusiastic praise. Casper has employed it quite extensively with benefit, and Kelly in the wards of the Johns Hopkins Hospital has had fairly good success from its use. The procedure is begun by injecting with a suitable syringe, once a week, 10 to 20 cc. of a 1 to 10,000 solution and gradually increasing the strength up to 1 to 1,000. The quantity is slowly raised to 50 cc. Guyon instils from 15 to 20 drops of a 1 to 1,000 solution, Kelly injects 30 cc. of a 1 to 10,000 solution, Casper rarely employs a stronger than a 1 to 5,000 solution. The more powerful solutions produce considerable pain and tenesmus which often continues for one or two days.

In my collected series 18 patients were improved, 15 unimproved, 2 cured, and 3 made worse.

Guyon in 33 instillations reports 15 patients unimproved, 8 improved, 5 very greatly improved, and 2 or 4 cured (?). In Casper's hands, there were some cases which improved very decidedly, but none were cured. In one instance in a man of 37, the pain ceased, urination became less frequent and there was an increase in weight.

In consideration of the fact that the tuberculous process penetrates the mucosa, implicates the submucosa and occasionally the muscle, it seems that any agent such as sublimate which for any beneficial action is dependent merely upon its antiseptic

property—a property which is utilized only when it is brought into direct contact with tubercle bacilli—can have at best nothing more than a superficial effect. Moreover, it exerts a deleterious influence upon the bladder mucous membrane, lowering its resistance and favoring the spread of the disease. I think, therefore, that while sublimate does good in some well selected cases, in the majority its effects are baneful.

Iodoform, in 5 to 10 per cent. mixtures with olive oil, liquid vaseline or glycerine, has been very extensively employed; 10 to 15 cc. of one of these emulsions are injected from 1 to 3 times a week. This drug has a slightly anæsthetic effect, is very well borne, does not damage the mucosa, probably is slightly anti-tuberculous, and would seem to be the best agent for instillation. It has found much greater favor with the majority of surgeons than sublimate, and has the very great advantage of being in no way harmful.

In my series there were 23 patients improved, 7 not improved, 1 made worse and 1 cured.

Chaudeleux injected 10 per cent. iodoform in ether in doses of 3 cc. This produced great pain, intense burning and discomfort. The procedure is simply mentioned to be condemned. It is hard to imagine how a man with any surgical knowledge whatsoever could inject such a mixture into the bladder.

Guiacol has been used alone in oil, and in combination with iodoform, in strengths of from 1 per cent. to 3 per cent. It has a local anæsthetic effect and is well borne. There are a few cases reported as improved, but none as cured.

Gemenol in from 5 to 10 per cent. solutions in oil has been employed and recommended by Hain; 4 patients were improved and 2 were unimproved; none was cured; and none was made worse. The agent belongs to the turpentine series; it is decidedly antiseptic but is not irritating.

Lactic acid was first used by Wittzack, who injected 2 cc. of a 5 to 8 per cent. solution once a week. The reactions were very marked; the pain and frequency were much increased and the burning and discomfort exaggerated. Casper used this

remedy and later substituted lactate of cocaine for it Both have now been abandoned

Pyrogallic Acid—Minet has had good results from the daily injections of 5 cc. of a 2 to 5 per cent, aqueous solution of this agent Røvsing has also employed it with little benefit

Formalin was recommended by Lamarque in the strength of 1 to 500, the amount of each injection is not given Guyon employed this drug in 7 cases, but had no successes

Creosote in weak solutions in oil was tried at the Necker Hospital in 3 cases of tuberculosis of the bladder, but had no effect

Nitrate of Silver is now generally admitted to aggravate rather than benefit tuberculosis of the bladder

In consideration of a few cures and a number of reported improvements following the use of instillations, it would appear that these procedures might merit a place in the treatment of bladder tuberculosis Nevertheless, after personal observation of a certain number of patients and a careful study of the general literature, I am convinced that in the large majority of cases they do no good, whereas in some instances in which the more powerful drugs have been used—bichloride, nitrate of silver, and lactic acid—they have produced considerable damage Personally, therefore, I neither use nor recommend them

Irrigations with dilute solutions of silver, boric acid, bichloride, etc., have been given a very fair trial, more extensive than they deserve, and in the main have been found wanting They do no good, and by distending the bladder they tend to aggravate the disease

Røvsing has reported lately very satisfactory results from carbolic acid irrigations He injects 100 cc. of a 0.5 per cent watery solution and allows it to remain for 5 minutes, and then to flow out through a catheter, the process is repeated until the liquid returns clear He treated 11 patients in this manner, 10 of them he reports as cured and 1 as greatly benefited Certainly, the percentage of cures would seem to be remarkably high

Summary.—When the primary focus is in the kidney, a nephrectomy should be done except in the very advanced cases and when the disease has become scattered. When it has originated in the epididymis, either an epididymectomy or castration is advisable, the choice of these procedures being governed by the extent of the disease. In those cases in which the infection has ascended to and implicated the prostate, the vesicles and the bladder, it is a question as to what is our best choice. In my opinion the operator should remove the diseased testicle or testicles along with the cord, and then wait for a while to see if this has any good effect on the prostate or vesicle; if improvement does not ensue, and the disease seems to be increasing, these organs ought to be excised, provided that the bladder is not too extensively affected, that the kidneys are free, and that there is no tuberculosis of the lungs or other organs. When the bladder, prostate, and vesicals have become infected secondarily to the kidney, a nephrectomy is to be recommended, and the remaining portion of the genito-urinary tract is to be left untouched at least for a while; later the enucleation of the prostate or vesicles may be considered. Complete removal of the seminal vesicles is an operation of magnitude and should be undertaken only after mature deliberation and then only by a skilful surgeon.

Irrigations of all kinds are useless and perhaps most of them are harmful. Instillations of all the stronger drugs are contraindicated. Iodoform in some cases may be of value.

The recent work of Wright and Douglas is full of promise, but it is too new to allow one to form an opinion as to its value.

In concluding this chapter on the treatment of bladder tuberculosis, I may be allowed to sum up the whole matter in one sentence:

Remove when possible the focus of bladder infection and send the patient to a suitable climate where he can live out of doors and where he will receive the proper quantities of well selected food. Surgical and medical treatment other than this has played a pitiful role.

(To be continued.)

DRAINAGE OF THE KNEE JOINT IN SEVERE INFECTIONS BY THE TRANSVERSE INCISION *

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SEPTIC infection in the knee joint constitutes one of the most alarming conditions which the surgeon is called upon to meet

The disastrous results both to limb and life render any procedure which can ameliorate its dire results and minimize the damage which inevitably follows worthy of serious consideration. Too often it has ended in amputation at or above the middle of the thigh, and not rarely in actual death from sepsis. In Flint's⁸ valuable study of infection of the knee joint, of 237 clean cases operated upon for various conditions 11 cases (4.6 per cent) were infected and required subsequent drainage. Of these one came to amputation. Thirty out of 52 penetrating wounds of the joint were infected (60 per cent), and of the 30 infected cases 4 died with or without previous amputation, 2 recovered after amputation and 2 after resection, 20 recovered with varying degree of disability, 4 of the 20 having complete ankylosis.

In his summary of 62 infections demanding operation, there were 7 deaths, 4 recoveries following amputation and 2 following resections, 49 recoveries with disability varying from slight limitation of motion to complete ankylosis.

While these statistics show the disastrous results of knee-joint infection, they also show a sufficient number of recoveries with good or reasonably good functional results from the simpler methods of drainage to illustrate one point which I

* Read before the New York Surgical Society, Dec. 12, 1906

wish to make, *i.e.*, that the method to be described is applicable only to severe cases where the best results aimed at are to save life, avoid amputation and secure a useful limb without joint motion. It is second in severity to amputation only, and should be reserved for cases in which efforts at drainage and irrigation have failed to check the process, or in which the general sepsis is such a grave menace to life as to prohibit the trial of less radical procedures. Employed in such cases I believe that limbs may be saved that would otherwise be sacrificed, and that the general sepsis may be checked with less immediate risk and often with greater certainty than by thigh amputation during the height of the infection. The fresh wound area exposed to absorption of septic products is insignificant, compared to that of a thigh amputation performed in a condition where asepsis is practically unattainable, and instead of the great wound and freshly sawn bone, one has the untouched synovial membrane and articular surface to aid in protecting the general system from further invasion of the sepsis. The lesser shock is also an important advantage in many of these desperate cases.

While the transverse incision has been employed by many surgeons since C. H. Mayo's original report in the *ANNALS OF SURGERY*, January, 1895,¹ it has seemed to me that in many respects it has not received the attention it deserves. Important points in technique, difficulties which one meets in carrying a case to a successful outcome, the reasons for and against complete resection as a secondary procedure have either been ignored or briefly alluded to in the few case reports, personal and published, which I have been able to find.

Technique.—The technique employed in the cases which have come under my observation and in my own case is briefly as follows:

1. A transverse curved incision crossing the patellar ligament to the posterior border of the condyles and prolonged upward as a shallow U (Fig. 1).

2. Complete division of patellar ligament, anterior capsule, both crucial and both lateral ligaments, leaving the pos-

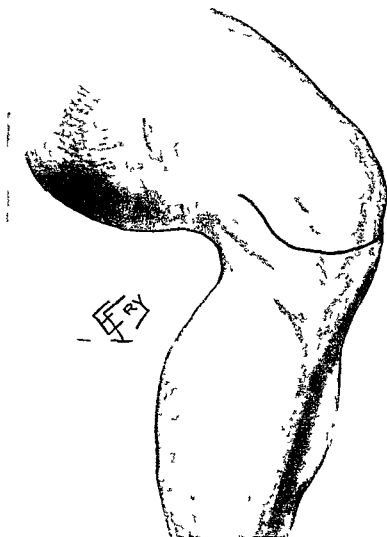


FIG. 1.—U shaped incision crossing patellar ligament to posterior border of condyle on either side and prolonged upward a short distance to allow the complete turning back of anterior flap upon the thigh.



FIG 2 — The patellar ligament, anterior capsular ligament and both lateral ligaments have been divided. The bones are still held firmly in contact by the crucial ligaments. The lateral expansions of the quadriceps prevent the turning back of the patella and free opening of the bursa.



FIG. 3 The crucial game is divided allowing the bones to drop apart. The lateral expansions of the quadriceps tendon are freely cut, the anterior flap everted and sutured to the thigh. The posterior recesses of the joint and the quadriceps bursa are now widely opened.

terior ligament alone intact, allowing separation of the bones and opening widely the posterior recesses of the joint (See Fig 3)

3 Lateral cuts through wall of quadriceps bursa, muscle and aponeurosis, allowing the complete turning back of the anterior flap, including the patella and all tissues down to the joint, which is then fastened to the skin of the anterior aspect of the thigh with a suture of heavy silk, opening the great bursa widely to its apex (Fig 3)

(Fig 2 shows the incision before the division of the crucial ligaments and the lateral cuts The bones are still firmly held together and the posterior recesses of the joint imperfectly drained The patella and skin flap cannot be everted, and the upper part of the joint cavity and quadriceps bursa are insufficiently opened)

4 Light packing of the entire joint with gauze moistened with a weak solution of bichloride or formalin and fixation of the limb in flexion (between 60 and 80 degrees) on a suitable splint

5 Secondary resection of the joint after suppuration has ceased, the temperature is practically normal and the joint and wound surfaces are covered with healthy granulations

In cases severe enough to justify this method ankylosis is a foregone conclusion Attempts to straighten the limb without resection are attended with great difficulty, owing to contraction of the hamstring muscles, and the tendency to posterior dislocation of the tibia Contraction of the skin flap leaves a broad area across the anterior aspect of the joint, covered with hummocks of granulations which heals slowly or demands subsequent skin grafting

Ankylosis between articular surfaces not resected takes place slowly and uncertainly, and if imperfect with just enough motion to cause pain is far less desirable than firm union of sawn bone

Resection seems therefore, the preferable secondary procedure if the technique described is followed The bony apposition is accurate and union firm, the skin flaps can be nearly

or quite approximated; and if done at the proper time, clean and prompt healing may be expected. The shortening should not exceed $1\frac{1}{4}$ to $1\frac{1}{2}$ inches, and does not add greatly to the disability. In children who have not attained their growth, however, the danger of excessive shortening from damage to the epiphysis is an important consideration.

From information kindly given me by Dr. R. F. Weir and from C. H. Mayo's original case report, the technique employed by W. J. and C. H. Mayo, as I understand it, differs radically in some important respects from that which I have above described.

The patella is divided transversely, the crucial ligaments are not cut and resection is not done as a secondary procedure. After the joint is clean, the attempt is made to suture the patella or its ligaments, the limb is straightened, and partial restoration of function is aimed at and obtained in some of the cases.

It would seem that this procedure should occupy a place between the simpler methods of drainage and the more radical method described, reserving the latter for cases in which secondary resection is the definite end in view. If the process can be safely checked without division of the crucial ligaments, and with preservation of even a limited range of motion, it is unquestionably the better method, and in certain cases this attempt might be made, leaving the division of the crucials to be done subsequently if needed.

There are cases of the more severe types, however, in which nothing short of the complete operation, opening widely every recess of the joint will save limb or life. In an unpublished case reported to me personally in which the crucial ligaments were not divided the process was not satisfactorily checked; the case recovered with complete ankylosis and posterior displacement of the tibia after prolonged suppuration during the course of which the crucial ligaments sloughed away.

The advantages of the operation over immediate resection are that it greatly lessens the danger of failure of union from

suppuration, septic osteomyelitis, or death from sepsis as a result of the operation. Even if amputation should become necessary later, the free joint drainage as a preliminary step should lessen the danger of that procedure.

After Treatment—The after treatment is of great importance, cleanliness is difficult to maintain, dressings are exceedingly painful and the greatest patience, gentleness and care in their performance is necessary.

The limb should be fixed in flexion (60° to 80°) on a bent wire splint, molded plaster of Paris triangle or some suitable apparatus. The entire region of the joint and wound, and often the site of secondary abscesses in thigh or leg must be left accessible for dressings. Pressure on the popliteal vessels, with consequent œdema of the leg, as well as pressure sores on the heel or other bony points, must be carefully guarded against. The everted skin flap should be separated from the thigh by strips of gauze.

It usually requires from three to eight weeks for suppuration to cease and the joint and wound surfaces to become sufficiently clean to permit of straightening of the limb or secondary resection.

The history of the following case illustrates some of the points dwelt upon in the preceding remarks.

B T, 21 years of age a Greek peddler, was brought from Bellevue to the French Hospital on June 23 1906, with a history of having received some injury to the right knee about May 15 1906, which resulted in infection of the joint. Multiple drainage openings were made, and at the time of his admission to the French Hospital, thirty nine days after the original injury, there was an advanced stage of suppurative arthritis with abscesses in the muscular planes of the thigh, and disorganization of the joint. The temperature ranged from 100.5 to 102.5 degrees pulse 104 to 120.

Blood examination showed 17,400 leukocytes, 85.4 per cent polynuclear cells. Blood culture was negative, cultures from pus in knee showed staphylococcus aureus in pure culture. The constitutional effects of chronic sepsis were marked, and it seemed

as though amputation would be necessary. It was determined however to first try the method of drainage by transverse opening of the joint, and operation was performed on June 28, 1906. A transverse curved incision was made crossing the patellar ligament, extending to the posterior part of the condyle on either side. From that point it was prolonged upward sufficiently to allow of eversion of the flap, which consisted of all the tissues down to the joint, including patella and anterior wall of the great bursa. The patellar ligament, the anterior capsule, both lateral ligaments and both crucial ligaments were divided, the posterior ligament alone being left intact. The eversion of the flap above referred to was then accomplished by making lateral cuts through the muscle and fascia, laying the quadriceps bursa widely open to its apex. The leg was flexed to an angle of about 60 degrees, the ends of the bones easily separating for an inch or more, and every recess of the joint was widely opened.

The suppurating tracts in the thigh were then freely opened and drained, and the limb put up in flexion on a triangular plaster splint. This had been constructed so as to avoid pressure on the popliteal vessels and interference with the circulation of the leg.

The temperature fell gradually, remaining below 100 after the twelfth day. The general condition improved, suppuration diminished and at the end of three weeks the entire wound surface was covered with healthy granulations.

Resection of the joint was done on July 19, 1906, twenty-one days after the first operation. Contraction of the flap and of the hamstring muscle made removal of $1\frac{1}{4}$ to $1\frac{1}{2}$ inches of bone necessary in order to approximate the skin edges, and secure good position of the limb. The sawn ends were fastened together with heavy silver wire. The patella was excised and the quadriceps and patellar tendons sutured together. Even with the removal of bone, retraction of the skin flap rendered perfect apposition impossible and narrow gaps between the few tension sutures inserted were left to heal by granulation. Healing was satisfactory and clean; bony union good and on September 20 the wires were removed, and the patient allowed to walk about with only a short splint. He remained about the wards and was quite content to act as a helper until November 1, when he was discharged able to walk easily without the assistance of a cane.

I am indebted to Dr Weir for permission to mention two other unpublished cases which have come under his care

The first was a man 25 years of age, admitted to Roosevelt Hospital on March 8, 1900. He had received a penetrating wound of a knee joint two days before admission. Infection had occurred and the joint was irrigated and drained through incisions on either side of the patella.

Suppuration continued, and on April 3 the joint was opened transversely, the crucial ligaments divided and the U shaped flap turned upward and fastened by suture in that position. The limb was treated in flexion of 30 degrees on wire splints. On April 22 the patient coming then under the charge of Dr Weir extension was applied to the flap. The temperature which had not gone to normal however continued to rise, reaching 105.4 on May 6, 106.2 on May 7. On May 8 thigh amputation was performed. Good recovery followed and the patient left the hospital improved on July 4, 1900.

The second case was a boy of 6 years, admitted to Roosevelt Hospital on October 16, 1905 under the charge of Dr Brewer, with a penetrating wound of the knee joint. Lateral incisions irrigation and tube drainage were first tried but symptoms of sepsis continued and six days later Dr Brewer laid the joint freely open by a transverse incision, dividing the crucial ligaments and turning the patella upward. The case came under the care of Dr Weir soon after, and on December 4, forty three days after the transverse opening of the joint resection was performed. Suppuration had ceased and the joint and wound surfaces were covered with healthy granulations. The temperature had been practically normal for some time. Resection was decided upon only after the great difficulty in overcoming the posterior displacement of the tibia and dealing with the contracted skin flap had been demonstrated. The patella was excised, a thin slice of bone removed from tibia and femur and the bones wired. Recovery was satisfactory and uneventful bony union was firm and healing without suppuration. The patient was about ready for discharge when he developed measles in the ward and was transferred on January 21, 1906.

A third unpublished case was one in which the typical operation was performed by Dr Brewer on a man suffering with

infected wound of the knee joint, on August 30, 1901, the crucial ligaments being divided, the flap sutured back, and the limb treated in flexion. Lateral incisions, irrigation and drainage done August 19 had failed to control sepsis.

The case was progressing favorably but not yet in a condition to warrant straightening of the limb, when he was removed from the hospital by his friends, against advice, on September 16, 1901, eighteen days after the operation.

Dr. Blake has given me notes of an unpublished case of non-traumatic suppurative arthritis in which transverse opening of the joint and turning up a U-shaped flap was done on a child 11 months of age, March 26, 1901. The crucial ligaments were not divided. The process rapidly subsided and the limb was straightened without resection nine days later. Shortly afterward the child developed scarlet fever, and was transferred. Healing was not complete at the time of transfer but suppuration had ceased and the local condition was progressing favorably.

Dr. Lilienthal has had three unpublished cases, which recovered with ankylosis, all in children. The joint was opened transversely and the crucial ligaments were divided; the limb treated in flexion, but instead of everting and fastening back the flap, it was split, through its centre to the apex of the bursa by a separate longitudinal incision after removing the patella. The limb was straightened without resection in all of the cases.

I have been unable to find a sufficient number of recorded cases to draw statistical conclusions of any value.

C. H. MAYO published his original case in 1895 and four subsequent cases in 1897,³ all recovered, two of the five having partial joint motion, stated to be about one-quarter of the normal range. In three only was it possible to re-suture the divided patella.

GERSTER reported two cases in 1895,² mentioning the ugly scar resulting in one case, a girl of 8 years of age, straightened without resection 38 days after the primary operation. He commended the method as described by Mayo, but gave few details as to technique.

BREWER, in 1901,⁵ published a case in which good recovery followed the complete operation, with division of the crucial ligaments and fastening back of the flap. Resection was done 6 weeks after the primary operation. The case was one of marked severity, with profound sepsis and joint destruction.

WHITEHEAD⁶ reported a case in which infection followed an operation

which he had performed for excision of a semilunar cartilage, in which incisions, irrigation and drainage failed to control sepsis, and the joint was opened by the transverse method 15 days after the primary operation. Fifteen days later the limb was straightened and half the patella excised, subsequent Thiersch grafting was necessary to complete the healing. He considered the method original.

MAITLAND published a case in 1905,³ in which straightening without resection was done 13 days after the primary operation, resulting in recovery with ankylosis.

Of these cases, none are mentioned as having recovered any joint motion except the two in Mayo's series.

W J MAYO, in 1901,⁴ wrote regarding the method, reporting recovery with 60 per cent of the normal range of motion in some of the cases.

Résumé—The operation should not be employed in mild or early cases, in which there is hope of recovery with some preservation of joint function, drainage and irrigation through multiple incisions being preferable.

A distinction should be drawn between cases in which the crucial ligaments are preserved and straightening the limb without resection, resuturing the patella or its ligament and preserving some degree of function is the end in view, and the severer cases where avoidance of amputation or death from sepsis are the sole considerations.

In the latter class of cases the complete operation is of great value, and should as a rule be followed by resection as a secondary procedure, except in children.

With the enormous raw surface exposed, dressings are exceedingly painful and cleanliness difficult to maintain. Pressure on the popliteal vessels with œdema of the leg, and pressure sores in the protracted cases must be carefully guarded against. Flexion of at least 45 per cent on a suitable splint is essential. Satisfactory straightening of the limb without resection is often difficult and sometimes impossible on account of shortening of the hamstring muscles and contraction of the skin flap.

The secondary operation should not be performed until suppuration has ceased, surfaces are cleanly granulating and temperature is practically normal, a period of from 3 to 8 weeks being usually required.

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DIFFUSE CAVERNOUS ANGEIOMA OF THE UPPER EXTREMITY.*

BY ASTLEY PASTON COOPER ASHHURST, M D

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MAMIE McC, 12 years of age, applied to the Out Patient Department of the Episcopal Hospital on October 16, 1906. She complained of disability of the right arm. On drawing up the patient's sleeve a cystic swelling was seen on the extensor surface of the forearm, just above the wrist. This was thought at first to be a tuberculous cyst, but when the whole upper extremity and thorax were exposed, the following condition was found. The front of the thorax on the right side is the seat of a nævoid formation composed of dilated capillaries or venules, giving the whole right pectoral region a distinctly bluish tinge. The discoloration is abruptly limited at about the mid sternal line, and below by a line passing transversely through the tip of the ensiform process. The area affected is not raised above the surrounding healthy skin. Posteriorly the nævoid condition is not so marked, but below the angle of the right scapula a mass about the size of a walnut, can be palpated. It feels like a lipoma. Just over the middle of the right clavicle is an angiomatic mass somewhat larger than a split pea, dark blue protruding and quite hard. Another similar phlebolith may be felt in the anterior axillary fold. In the right supraspinous fossa, at a point corresponding to the free margin of the trapezius muscle is a somewhat larger bluish mass, which protrudes distinctly from the surface of the skin in this region, is compressible, and is evidently composed of cavernous tissue. An area of bluish discoloration, not raised above the surrounding skin, may be seen below the point of the shoulder, over the deltoid muscle.

The skin of the arm, forearm, and hand presents no abnormalities in structure, but the whole upper extremity is slightly livid, and there is œdema of the fingers and hand. On the exten-

* Read before the Philadelphia Academy of Surgery December 3 1906.

surface of the forearm, as already noted, there is a cystic, compressible swelling, not circumscribed, about the size of an egg. The flexor surface of the forearm in its upper half is also somewhat enlarged, and is indistinctly cystic. Elevation of the hand above the head causes an almost total disappearance of these swellings in the forearm, while they quickly reappear when the hand is lowered. By compressing the arm below the shoulder the hand and forearm quickly become alarmingly distended, the cystic swelling becomes bluish and very tense, and pain produced.

The circumference of the forearm above the wrist, when the hand is down, is 14 cm., but is only 11.5 cm. when the hand is elevated above the head. The circumference of the forearm below the elbow is 20.5 cm. when the hand is down, 18 cm. when it is raised. The circumference of the arm above the elbow is 19.5 cm. when the hand is down, only 17.5 cm. when it is raised. The measurements of the corresponding parts of the left upper extremity are: Above the wrist, 13 cm.; below the elbow, 19 cm.; above the elbow, 20 cm.

The length of the right upper extremity from the acromion to the tip of the styloid process of the ulna, the elbow being extended, is 41 cm.; that of the left is 43 cm.

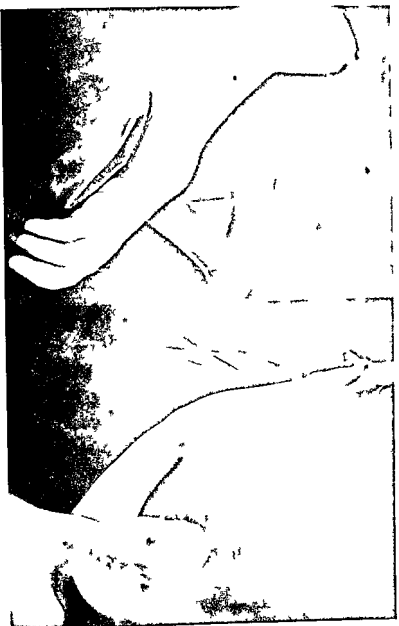
The superficial veins of the affected forearm are not visible, even when the hand has been hanging down for some time.

The heart appears to be normal both in location and action. No abnormality in the other thoracic structures has been detected. The axillary, brachial, radial and ulnar arteries pulsate with fair regularity in their normal situations. The radial pulse, synchronous in both arms, varies from 90 to 100 per minute when the angeiomatous arm is raised; and is about 120 per minute when it is dependent.

The cystic swelling above the wrist may be partly lipomatous in character, as it does not entirely disappear when the hand is elevated, some palpable irregularities persisting in the subcutaneous tissues. It is impossible to detect the extensor tendons by palpation.

Skiagraphs were made of the clavicular and cervical regions, and of the forearm. The former was entirely negative; the later possibly shows some atrophy of the bones of the forearm.

Although the condition in this patient is congenital, it is only within the last few months that she has been disabled. Her



F c 1—Showing increase in sweating when hand is down

F c 2—Showing decrease in sweating when hand is elevated



family and her previous personal histories are negative Her arm was always weak and it was known that there was something wrong with it, but no particular attention was paid to it She attended school regularly, and until the close of the session last summer was able to write and figure with her right hand Of late the fingers and even the hand have become numb, the grasp is so feeble as to be practically absent,* and though she has resumed her school this autumn, she is no longer able to hold a pencil There is present almost constantly a dull aching pain, which is considerably relieved by firm bandaging A flannel bandage is applied with the hand elevated well above the head, and the arm is carried in a sling General health good

The following classification of angeiomata, taken from Mauclaire and de Bovis, considerably simplifies their description

External	Superficial	<ul style="list-style-type: none"> Skin and external mucous membrane Subcutaneous and submucous tissues
	Deep	<ul style="list-style-type: none"> Intermuscular tissues Muscles Orbit and antrum of Highmore Periosteum and bones Subsynovial tissues Glands
Internal	<ul style="list-style-type: none"> Subserous meninges peritoneum etc Visceral liver, spleen etc 	

These tumors are further classified as circumscribed and diffuse The angeiomatous condition in the present patient appears therefore to be chiefly of the diffuse subcutaneous cavernous variety, although, as is not unfrequently the case, the neoplasm is really of mixed chaacter, being cutaneous in small areas, as in the supraspinous fossa, and in the pectoral region is of the telangiectatic cutaneous variety, while in the forearm the growth undoubtedly involves the intermuscular planes, and has probably destroyed most of the muscular tissue

* At present (February) the grasp is noticeably stronger

Duplay and Cazin remark that subcutaneous angeiomata closely resemble cold abscesses in appearance, and it will be remembered that in the present case the swelling on the dorsum of the forearm was at first sight thought to be of tuberculous origin. The best clinical description of the cavernous angioma that I have been able to find is that given by Weinlechner, in Gerhardt's system.

Angeiomata of the extremities are rather unusual, and those of the diffuse cavernous type appear to be quite rare. Of all forms of angioma, including the ordinary mother's mark, the usual location is the head, and the least usual the limbs, as may be seen from the following table:

Head and neck.....	57 per cent. (Kramer), 79 per cent. (Gessler).
Trunk.....	28 per cent. (Kramer), 11 per cent. (Gessler).
Extremities.....	12.5 per cent. (Kramer), 9 per cent. (Gessler).

The question of treatment in these cases is as unsatisfactory as their pathology is obscure. Excision is scarcely possible in the diffuse form, though in cases of circumscribed cavernous angeiomata, whether cutaneous or subcutaneous, it is sometimes feasible, and is usually followed by permanent cure. Amputation at the shoulder joint, the most radical form of treatment available in the present case, might prove a remedy more serious than the disease itself; and in view of the implication of the pectoral and scapular regions might be followed by increase of the angeiomatous condition in the parts that were not removed. The injection of boiling water or other fluids, is a method neither invariably successful, nor entirely safe. Boiling water is much less dangerous than caustic or coagulating fluids, and in the hands of Dr. Wyeth, the originator of the method, has not, I believe, been attended by untoward effects. Other surgeons, however, without his experience, have been less fortunate. Payr has reported eight or nine cases of angioma treated successfully by the introduction of magnesium darts in the growth. The little darts, or tacks, as they have been called, are soon absorbed, but they induce the formation of compact connective tissue with throm-

basis and obliteration of the blood spaces Heide has quite recently treated a patient afflicted with a diffuse cavernous subcutaneous angioma of the lower extremity by means of electrolysis, and has obtained results which he considered satisfactory He used a current of from 30 to 40 milliampères, for 3 or 4 minutes at each sitting He began in the gluteal region, and gradually worked down to the foot, but the foot itself was not benefitted by the treatment, as the angiomatous swelling could no longer be made to disappear when the foot was elevated Another result of the obliteration of the cavernous spaces and of the connective-tissue formation was that during the last sittings the hæmorrhage became considerably diminished in amount

A brief abstract of all the similar cases it has been possible to find in a somewhat extensive search of the literature is appended

(1) ABEE reported the case of a young man with an angiomatous condition apparently more cutaneous than subcutaneous involving the whole right upper extremity The skin was very thin, and the slightest scratch was liable to cause profuse hæmorrhage

(2) AUDRY—A female, aged 20 years, whose left upper extremity had always been larger than her right, had been troubled with its more rapid growth since the age of 8 or 9 years The left hand and forearm to lower third of arm were very œdematous, spongy and compressible to touch. Ulcers formed in fingers, and arm was amputated through upper third of humerus, to hinder further infection Dissection showed that the skin was thickened and elephantiasis like in character Beneath skin was a diffuse cavernous angioma, extending to bones, eroding them and destroying muscles and smaller nerves The arteries were normal The left scapular region was also affected, but it was more lipomatous in character than the forearm. The skin was nowhere nævoid through out the upper extremity

(3) COLEY recorded the case of a girl of nineteen years, whose fingers and the extensor surface of whose left forearm above the wrist were the seat of an angioma cavernosum apparently diffuse and subcutaneous, although this is not stated. The swelling of the forearm was the size of an egg Over the left scapula was a lipogenous angioma, the size of a cocoanut. All these swellings were adherent to the skin. The hand and forearm were bluish in color The scapular growth was excised, and found to be an extremely vascular lipoma An attempt was made to excise the growths from the fingers, but the operation was abandoned on account of hæmorrhage. Good illustrations accompany the report.

(4) CRUVEILHIER.—Female, 75 years, paralytic, demented, blind, no history. Left hemiplegia. The left upper extremity was flexed, rigid, and covered with varicose cutaneous and subcutaneous tumors. Autopsy showed that the subcutaneous tissues and muscles were the seat of a diffuse cavernous angioma; the skin was invaded in some parts, and in these regions bluish masses of varicose veins protruded. Several phleboliths were present.

(5) HEIDE.—Boy of 12 years, presented a diffuse angioma of the left lower extremity, involving buttock, back of thigh, popliteal space, fibular surface of leg, and dorsum of the foot. The skin was bluish, and prominent in places (cutaneous), although the main growth was subcutaneous and muscular. The circumference of the limb when dependent was 3 to 4 cm. greater than when elevated above level of trunk. Muscular power was very weak. A small piece of tumor was excised for examination; after cutting through the subcutaneous tissues, the deep fascia was seen, dark blue in color; on excising it the underlying tissue bulged out hernia-like, and looked like a mass of extremely thin walled veins, blackish blue in color. No trace of muscular tissue was visible microscopically, but under the microscope were observed a few atrophic muscle fibres, their place being taken by fatty and connective tissue. The cavernous spaces were lined with endothelium. The treatment adopted has already been described.

(6) LAMORIER.—Man, aged 70 years, the whole right upper extremity being affected, including the pectoral and scapular regions. The skin was bluish black, the angioma was diffuse, and on elevation of the hand the swelling rapidly disappeared from the hand, forearm and arm, and a larger swelling appeared in the pectoral and scapular regions. The condition was congenital, not painful; and autopsy showed all the muscles converted into a splenoid or placenta-like tissue.

(7) LICHTENSTEIN.—Man of 36 years, with diffuse subcutaneous cavernous angioma of right hand and forearm. At birth a small nodule was present on finger, and this was operated on in childhood. The angioma gradually extended up the forearm. The hand was œdematous and the forearm was the seat of a distinct swelling. The skin was not discolored except at scar of old operation. A few phleboliths were palpable. Superficial veins were not noticeable. The pulsation in the arteries was normal. There was no pulsation in the tumors. The patient was directed to wear an elastic bandage.

(8) LICHTENSTEIN.—A boy aged 7 years. At birth the left upper thoracic region and the left arm were somewhat blue; soon a lump the size of a small pea was noticed on the nipple, and another on the knuckle of the fourth finger. Four weeks before examination these lumps reached the size of large peas, and developed the characteristics of cavernous angiomata. The left upper extremity was shorter than the right by 3.5 cm. The superficial veins were not prominent, but there was present a diffuse cavernous angioma of the hand, forearm and arm; the axilla was full, no axillary folds being present. The pectoral region was bluish, and one small mass was palpable. Above the clavicle there

was a bluish line of veins. The skin of arm and forearm was distended when the hand was down, but became flaccid when it was elevated. The skin was involved, the angiomatic condition having started apparently as subcutaneous in character, and later involving the cutaneous tissues. The arteries were normal, but the pulse was 80 when the arm was dependent, and only 64 when it was raised. No treatment is mentioned.

(9) RICHET—A boy of 11 years, with a diffuse cavernous angioma of the subcutaneous variety on the lower two thirds of the flexor surface of the forearm, involving also, by extension under the annular ligament at the wrist, part of the thenar eminence in which latter situation the growth was rather of the cutaneous variety. The flexor tendons could not be palpated. The tumor was painful on pressure, and pressure caused it almost to disappear. Elevation of the hand rendered the color of the overlying skin nearly normal, and allowing the arm to hang down made it a deep violet blue, and on the thenar eminence a few varicose veins then became visible. The swelling of the forearm had neither pulsation nor bruit. This condition had lasted only 20 months. Treatment by injections of perchloride of iron was instituted, and when the patient was seen one year later the swelling on the forearm was firm in consistency, little nodules being palpable wherever injections had been made. The tumor could no longer be made to disappear by pressure, and in the upper part of the forearm there was still evidence of the persistence of the cavernous condition. The skin had become even whiter than on the sound arm.

(10) ROKITANSKY—Male adult, subcutaneous diffuse cavernous angioma involving whole right upper extremity, and extending past axilla on to thorax. In certain regions soft bluish masses, feeling like lung tissue, projected from the surface of the limb.

(11) SCHUH—Young man, subcutaneous diffuse cavernous angioma of anterior aspect of foot, extending up to knee. The growth had extended through everything down to the bone. Skin was scarcely at all affected but was livid when limb was dependent. Many phleboliths. If the patient stood up the limb grew to an enormous thickness, and became blue and tense, but no varicose veins were visible. All the tissues between skin and bone seemed to have been destroyed by the tumor. It had not increased in the last 12 years, and with an elastic stocking patient was able to walk and even swim.

(12) SCHUH—Young man without known cause, suddenly developed growth on hand which rapidly extended up to middle of forearm. The skin was naevoid in places, and very thin. Elevation of limb caused skin to lie in loose folds, and outlines of bones could be easily felt. Phleboliths were palpable. No enlarged superficial veins could be detected. Amputation was refused, and the patient died a year later of phthisis.

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FRACTURE OF THE CORACOID PROCESS OF THE SCAPULA CAUSED BY MUSCULAR ACTION *

WITH REPORT OF CASE.

BY ORLANDO H PETTY, M D

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The following is my record of the case

A man, 57 years of age, a trolley car conductor by occupation, while trying to forcibly put a drunken man off of his car, experienced a sudden and severe pain in his right shoulder, which practically rendered his right arm useless. He is sure that he neither fell, nor that his shoulder was struck in any manner. At the onset of the sudden and severe pain he was steadying himself by holding to the hand rod on the rear platform of the car with his left hand, the passenger being on the same level as the conductor, and was pulling with all his strength through his right arm trying to expel the disorderly passenger. During the several hours following the accident that he remained at work, he experienced severe pain in the right shoulder and an inability to use his right arm in ringing up fares or signalling the motorman.

The patient is a well developed, powerfully muscled man. When he presented himself to me, October 15, 1906 he was unable to raise his right arm from his side. He could elevate his shoulder but could not shrug it forward, although he could, with little discomfort, throw his shoulder backward, after it had been pushed forward.

The function of his forearm and hand was unimpaired. Examination revealed nothing wrong in the shoulder joint, clavicle, or acromion process, but severe pain was induced when pressure was applied over the coracoid process and bony crepitus was elicited in this area.

* Read before the Philadelphia Academy of Surgery, December 3 1906.

A fracture of the coracoid process being evident, the right arm was dressed in the Velpeau position, and later in the evening Dr. Fussell saw the case with me and confirmed the diagnosis. As the patient experienced great inconvenience from the Velpeau position, the dressing was changed, binding the right arm to his side, and leaving his forearm free.

Two or three days later, Dr. Pancoast of the University of Pennsylvania Hospital, took a skiagraph of the injured shoulder, and it revealed a fracture at the middle portion of the coracoid process, with a tipping downward and inward of the distal portion of the process. Dr. Pancoast said there had been many patients referred to him with a clinical diagnosis of uncomplicated fractured coracoid, but that this was the first case to be confirmed by the X-ray findings.

Result.—About the middle of the sixth week, crepitus having disappeared and the fracture apparently firmly united, the shoulder was treated by light massage and passive motion. He returned to work at the end of the seventh week. He is still unable to raise his right arm high above his head.

Fracture of the coracoid process of the scapula is not common, and an uncomplicated fracture of this process is a rare condition, while of its fracture by muscular force I could find but three cases mentioned. One of these was evidently discovered in the cadaver during dissection, another observed by Hulme, and the third a brief reference to a case of Stimson. These reports will be fully referred to later in this paper.

It is interesting to note the opinions of the earlier authors upon this fracture.

MALGAIGNE says: "This fracture is excessively rare, and does not occur except in company with other fractures and enormous contusion of the soft parts, so the case is generally of the gravest nature."

In S. D. GROSS's *System of Surgery*, 1864, we find the following comment: "The coracoid process is sometimes broken in consequence of a severe fall or blow, generally a short distance from its tip, the fracture being usually accompanied with great contusion of the soft parts."

ASHHURST, in *Erichsen's "Science and Anatomy of Surgery in 1869,"* says: "The coracoid process is seldom broken, there not being more than ten or twelve unequivocal cases of this accident on record. It cannot



FIG. 1.—Fracture of coracoid process of scapula. Tip tilted inward.

happen except by direct violence." And even in a work as late as Scudder's "Treatment of Fractures" second edition, the coracoid process of the scapula is not mentioned as ever being the seat of a fracture.

Prof EDWARD BENNETT of Trinity College, Dublin, in 1873 in reporting a case of epiphyseal separation of the coracoid process in a child of 6 years of age, caused by a crushing force, concluded with the following "This specimen is of particular interest in as far as it completes the series of coracoid fractures in our collection, which contains already several specimens of the fracture associated with the dislocation of the humerus, a specimen of fracture from muscular action and fractures from direct injury in the adult."

J Wellington Byers, of North Carolina, reviewed the fractures of the coracoid process up to 1885, and collected a score and a half of authentic cases of coracoid fracture but found none caused by muscular action. The following are his remarks on the etiology of the condition "To class these injuries according to the manner of causation, it will be found that nearly half of them result from falls upon the shoulder, the others resulting from direct blows"

Byers either discredited or overlooked a case of fracture of the coracoid process by muscular action, reported in the *Lancet* in November, 1873, and thus described by HULME:

' T H, æt. 57, miner. Three weeks previously he was on a bank in the act of passing through a wire fence when he slipped and in falling his left arm caught in one of the wires. He instantly felt a severe pain in the fingers, followed by loss of power in the arm and inability to raise the arm from the side. On examination it was found that the coracoid process of the left scapula was fractured and drawn downward."

R CLEMENT LUCAS in *Guys Hospital Reports*, 1890, gives five methods of fracture of the coracoid process of the scapula

- (1) Direct violence
- (2) By dislocation of the humerus
- (3) By extreme flexion of the shoulder joint, when the coracoid process is thrown into forcible contact with the under surface of the clavicle.
- (4) By downward crushing of the clavicle upon it.
- (5) By sudden muscular action

Mr. ARBUTHNOT LANE in 1887 first called attention to the extreme flexion of the shoulder joint as a probable cause of fracture of the coracoid and cited as instances two cases quoted by HULKE in Holme's System of Surgery. They are thus described :

"Two cases of fracture of the coracoid process have come under my notice. In both the fracture was caused by a fall forward from a slight height, with the arms stretched forward. There was mobility of the tip of the process with crepitus and pain, but not displacement."

The comments of LUCAS are: "If this account be correct, Mr. Lane's explanation would appear to be the only possible one."

If the opinion of Mr. Lucas explains the two cases observed by Hulke, I think the theory of Lane, that extreme flexion may be the cause of the fracture, applies equally as forcibly to the case I have just quoted, which Hulme attributes to muscular action, for Hulme says that in falling the patient caught his left hand in one of the wires of the fence; this it seems to me would cause extreme flexion of the shoulder. The specimen referred to by Bennett, as being caused by muscular action, is in the museum of Trinity College, Dublin. There being no record of an examination at the time of accident and no history of the case, its etiology can hardly be considered unequivocal.

Stimson, in his work on fractures and dislocations, speaks of the fracture of the coracoid process of the scapula in this manner:

"This may be caused by muscular action or by direct or indirect violence. In the former the causative effort is sometimes comparatively slight, wringing of wet clothes in one case, but more often is a powerful effort made with the arm.

In reviewing the literature I have carefully read all the reports and reviews of the cases that I could find and found no case caused by muscular action, that had a full history of the accident and physical examination confirmed by skiagraph.

REPORT OF OPERATIONS

PERFORMED AT THE PUBLIC CLINICS FOR STUDENTS AT THE GERMAN HOSPITAL
OF PHILADELPHIA, DURING THE SESSION OF 1905 TO 1906 *

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TWENTY SIX clinics were held at which there were 215 patients operated upon, with a total of 244 operations. It was found necessary to perform 52 operations on 23 patients at the same sitting. The mortality was 9 cases, or 4.2 per cent.

APPENDIX.—There were 64 cases of *appendicitis* operated upon of which 39 were acute. Of the patients with acute appendicitis there were 29 males and 10 females. The appendix was found acutely diseased and removed at the same time in 4 patients operated upon for other conditions in which it was involved, of these patients 1 was a male and 3 females. In these 64 cases there was 1 death, that of an acute case in a male. The average duration of the attack for which the acute cases were operated upon, estimating from the onset of the attack up to the time of operation, was, in the 23 cases without abscess, 4.3-10 days, and in the 16 cases with abscess, 8 days. Seven of the 23 non abscess cases were operated upon in their first attack, 9 of the 16 abscess cases had had no previous attacks.

The incision varied according to the pre-operative findings. Of these acute cases, in 12 the McBurney or gridiron incision was made, in 19 the incision was made either through or at the outer border of the right rectus, and of these, in 2 cases it was necessary to make a counter incision in the right flank for extra drainage, and in 2 others a small suprapubic incision for tubal drainage of the pelvis. The 8 remaining

* Read before the Philadelphia Academy of Surgery, December 3
1906

cases required extraperitoneal incisions, of which 3 were assisted by suprapubic counter-incisions, and 1 by a counter flank-incision. In 2 cases the pelvic exudate was drained by a tube emerging from the incision in the right rectus muscle.

In 7 cases there was free pus in the pelvis at the time of operation, in 10 there was an abscess near the cæcum, and in 9 the intestines were covered with lymph or pus exudate.

The appendix was subcæcal in 16 cases, to the outer side of the cæcum in 6, in one of which the organ ran up toward the liver, to the inner side in 3, and in 5 cases to the brim of the pelvis or into the pelvis. In 4 cases the pathological condition was so severe as not to warrant searching for the organ, or removing it even when seen. (In the remaining 6 cases, the position of the appendix was not stated.) The organ was necrotic or gangrenous in 9 cases, perforated in 4, kinked in 2, and the remainder were either adherent, congested, swollen, or covered with inflammatory exudate. When possible the appendix was wholly amputated flush with the cæcum, the resulting gap being closed by two semicircular silk sutures which intertwined at each pole of the organ, and in some few cases in which stump-amputation was performed, the invagination was maintained by a silk purse-string suture. The badly diseased appendices were ligated near their bases with catgut and the stump-surface cauterized with liquified carbolic acid, no invagination being performed.

Drainage was required in 15 of the 39 acute cases, and consisted of gauze in 6 cases, glass drainage tube with gauze in 8, and glass tube alone in 1. In the remaining 19 cases, the wounds were closed with tier sutures of chromicized catgut. The majority of the leukocyte counts maintained a direct ratio with the severity of the case. In many abscess cases in which the urine was examined shortly after admission and previous to operation, there was found a marked toxic nephritis which subsided within a day or two after operation. This deleterious action of the pus upon the economy in general and the kidneys in particular, not to mention the peritoneum, we consider a strong argument against postponing operative measures.

A young woman, whose first attack was two weeks under way on the day of admission, exhibited merely slight abdominal distention and slight rigidity of both recti muscles, but tenderness over the entire lower portion of the abdomen.

On incising extraperitoneally, a large amount of pus mixed with serum was evacuated, and 3 large abscesses were located and drained—one deep in the pelvis, another in the median line, and the third at the lower margin of the liver. As the appendix was bound in the abscess wall, it was not removed.

A man, whose second attack began two days before admission, revealed, on examination, general distention and tympany of the abdomen and board-like rigidity of both recti muscles. There was marked tenderness all over the right side of the abdomen, but especially over McBurney's point. The appendix was bound by plastic exudate to the cæcum, was 9 cm long, thickened, swollen and congested, and the seat of two perforations. In places it was gangrenous. It was necessary to make a counter-incision in the right flank to permit of additional drainage.

The death occurred in a man whose case was very similar to that just cited, except that he was admitted four days after the beginning of his second attack. Examination revealed a leaky skin and evidences of general septic infection. The abdomen showed general distention and tympany, marked rigidity of both recti but greater on the right side, and general tenderness over the entire abdomen, most marked over the right iliac fossa.

Incision opened up a large retro-cæcal abscess in the vicinity of which the intestines were bound together in a plastic exudate, and elsewhere an extensive purulent peritonitis was present. The appendix was 7 cm in length, retro-cæcal, gangrenous in its lower third, and perforated. So, too, as in the preceding case, a counter incision was made in the right flank to obtain free drainage. The patient lingered five days after operation. Post mortem revealed an acute fibro-purulent peritonitis, focal gangrene of the cæcum and distal 15 cm of the ileum, with parenchymatous degeneration of the liver and kidneys. These last two cases are almost identical in every respect with the exception that one, the fatal one, was two days further advanced in his attack than the other, but *he died*, while the other recovered. This is another forceful and convincing illustration of the oft repeated cry that *delay is fatal*. And it shows actually

the damage done to the organs by retention of highly toxic pus, which was spoken of above when estimating its effect on the kidney by clinical examination of the urine.

In 25 cases of *chronic appendicitis*, 10 were in males and 15 in females, with no deaths. The appendix was found chronically diseased and removed in 8 patients at the same time the condition for which the operation was performed was relieved; of these, 1 was a male and 7 were females. The time elapsing since the last attack varied from seven days to two years. In one case, that of a physician, the disease had existed for 12 years, until continual pain and soreness over the appendix when walking and after eating, which had existed since the last attack, a year previously, led him to seek relief. This same complaint was given by 8 of the 25 patients, bringing them to operation which almost invariably revealed adherent appendices. In 7 cases there was marked constipation, in 4 of which the appendices were bound down by adhesions. One patient, a female, suffered for a year with symptoms that simulated cholelithiasis, complaining of almost continual pain in the epigastrium, at times radiating to the right shoulder, frequent biliary vomiting after eating, and two distinct attacks of jaundice. Operation revealed a slender cord of omentum, 10 cm. long, between the otherwise normal gall-bladder and the chronically diseased appendix. The appendix of another woman contained 2 ascarides of the variety *oxyuris vermicularis* (thread worm). In a man the appendix was found anomalously placed on the ascending colon, 10 cm. above the cæcum. The other appendices were found to be thickened, kinked, congested, constricted or adherent. The lumina, usually patulous, at times were partially obliterated, or contained faecal concretions.

The McBurney incision was made in 16 cases and in the remaining 9 the incision was carried through the right rectus muscle. The appendix was wholly extirpated by the method mentioned above in 12 cases: the stump was invaginated into the cæcum by means of a silk purse-string suture in 12 cases, and in the remaining case the organ was simply amputated,

and the stump cauterized owing to its difficult retrocæcal position. The abdominal layers were approximated with tier suture of chromicized catgut in all cases except one.

Carcinoma of the Appendix—This was present in the case of a female, aged 23, whose appendiceal history had extended over a period of five years, in which there occurred three attacks. The appendix was kinked and curled about the cæcum, curved on itself, its lumen obliterated, and its proximal part congested and swollen. Microscopical examination revealed carcinoma.

THE STOMACH—Pyloric Stenosis—There were 7 cases of pyloric stenosis, 5 benign and 2 malignant. The benign cases were all due to chronic gastric ulcer, and all recovered from the posterior gastrojejunostomy. There were 4 males, ages 15, 20, 25 and 53, and 1 female, age 57. All complained of chronic dyspepsia.

In addition to the thickening, induration, and cicatrization of the pyloruses, the stomachs were all markedly dilated. Five years previously the oldest male had undergone a pyloroplasty elsewhere, after a year's relief, aggravated symptoms returned. In the female, the gastric mucosa presented a markedly hæmorrhagic "weeping" appearance, and the second and third parts of the duodenum were congested. Note was made that one of these patients on discharge two weeks after operation, could eat solid food without discomfort, and had gained two pounds already during that time.

The 2 carcinomata were in males, ages 50 and 55. In both the fulminating dyspepsia symptoms—6 weeks' duration in the elder with the loss of 35 pounds, and 1 year in the younger with the loss of 30 pounds in the latter 4 months—were strictly in contrast to the chronicity of the benign cases. Posterior gastrojejunostomy relieved the elder of symptoms. The death occurred in the younger emaciated man, who in addition to the stenosis showed perigastric adhesions, secondary carcinoma of the head of the pancreas, and a distended gall-bladder. Pylorectomy, drainage of the gall-bladder, and posterior gastrojejunostomy were performed.

Cardiac Stenosis.—There was one case of cardiac stenosis in the person of a female, aged 43, who suffered ten months from symptoms due to gradual thickening of the cardia. Operation revealed a large, diffuse mass at the cardia, extending down over the greater curvature, and infiltrating the wall sufficiently to prohibit gastrostomy. Jejunostomy, however, gave relief.

Acute Gastric Ulcer.—This occurred in a woman aged 37 years, who six months previously had been treated in the medical wards, when at one time she vomited 2,000 cc. of bright red blood; she apparently recovered and was discharged cured. Three days before admission to the surgical ward she had a recurrence of hæmorrhage, vomiting 1,500 cc. of bright blood. On the day of admission she vomited 2,000 cc. bright blood, and two hours after admission 1,500 cc. of dark blood. The patient was extremely anæmic, suffered from air-hunger, thirst and had a rapid pulse. She was treated medically with the hope that her condition would improve and warrant operative interference later; as there was no evidence of improvement and the patient was becoming weaker, gradually declining, it was thought under the circumstances best to do a posterior gastroenterostomy. The patient did not survive long. The mucosa showed multiple ulcers and a hæmorrhagic or "weeping" state.

LIVER AND GALL PASSAGES.—There were 8 cases of *cholelithiasis*, all females, in 4 of whom the gall-bladder was removed. Three had had enteric fever; in 1 this disease occurred four months previous to operation; chills in 1.

Jaundice occurred in 3 cases, biliary colic in all, biliary vomiting in 4, and nausea without vomiting in another.

Adhesions existed between the gall-bladder and transverse colon (1 case); liver margin, transverse colon and pylorus (1 case); omentum adherent to gall-bladder and liver (1 case); between omentum, transverse colon and gall-bladder (1 case); no adhesions 4 cases.

Calculi, from 2 to 500 were removed from the gall-bladders in all the cases, and from the cystic duct in 3; from the common duct in one case 4, and in another, 1.

Of the excised gall-bladders, 2 were greatly thickened, 1 was extensively diseased, and the fourth was the seat of

empyema The four remaining gall bladders were drained by rubber tube, from 20 to 300 cc of bile of varying consistency being present. A rubber tube drained each of the 2 common ducts from which the gall bladder and calculi had been removed. Strips of gauze and rubber dam were used in 7 cases.

In a case in which the gall bladder was ulcerated, 200 cc of bile stained pus were evacuated from an abscess below the gall bladder. The omentum was stitched across the wound in the middle, thus separating the upper wound from the gall bladder below.

A chronically inflamed appendix was removed from one case.

Biliary Fistula—This was present in a male aged 23 a sufferer from enteric fever five years previously, from whose gall bladder 200 calculi had been removed elsewhere 18 months previously this operation being followed by a biliary fistula to close which an unsuccessful attempt was made 4 weeks after discharge. The fistula was obliterated by invaginating the edges of the gall bladder drainage 1 piece of gauze.

Cholecystitis—Six operations for cholecystitis were performed on 3 males and 3 females one of the latter dying 7 weeks afterwards from a pronounced myocarditis. Two patients had had enteric fever. All had been jaundiced all had cramps or pain in the right hypochondriac region and one had chills. Adhesions were present in one between the gall bladder liver and duodenum and in another between the gall bladder and pylorus. In no case were calculi found and all the ducts were patulous. Drainage in each case consisted of a rubber tube sutured in the gall bladder, beneath which was placed a gauze strip isolated by rubber dam.

A chronically inflamed appendix was removed from one case.

Pericholecystitis—A female aged 40 had been relieved of 25 biliary calculi elsewhere 10 years previously, and a year later similar attacks of biliary colic recurred. A month before admission the previous drainage site opened up discharged three calculi pus bile later, and closed again. The attacks ceased but discomfort persisted. Operation revealed extensive adhesions between the abdominal wall, omentum, gall bladder and duo-

denum, but no calculi. The adhesions were separated and gauze drainage instituted.

Chronic Interstitial Pancreatitis.—This occurred in a man aged 55, a sufferer from indigestion with occasional severe vomiting for 21 years. Six years previously he had sudden epigastric pain and since then slight epigastric soreness had persisted, and increased a year before admission, since which time he has experienced progressive loss of strength and flesh, reducing from 200 to 166 pounds in the year's time. On admission he was emaciated and anæmic, with a firm mass in the epigastrium. Operation, consisting in gall-bladder drainage by a rubber tube aided by gauze in rubber dam adjoining the cholecystotomy, revealed a hard nodular pancreas, moderate hepatic cirrhosis, gall-bladder distended with bile but no calculi. Before operation the fæces exhibited free fat and bile pigment, but no undigested muscle fibres.

HERNIA.—*Inguinal.*—There were 8 operations, 6 males and 2 females. Of these herniæ, 2 were bilateral, 3 right and 3 left, and of the right two were irreducible, 1 being strangulated. Half these patients had worn trusses. Primary union followed the 10 Bassini operations.

In one patient, a woman aged 23, the right inguinal hernia was congenital, and perineorrhaphy was performed at the same time.

Umbilical.—This woman, aged 42, the mother of 7 children, had had the hernia 10 years in addition to a left inguinal hernia. At operation, the sac of the former was adherent, and contained omentum but no gut. The recti were overlapped.

Incisional.—These 2 herniæ, both in women, followed appendiceal abscess operations that required free drainage. One was of 6 and the other of 30 months' duration.

Fæcal Fistula.—There were two cases of fæcal fistula. One developed in a student 5 days after the repair of an incisional hernia elsewhere, which in turn 3 months previously had followed an operation for acute appendicitis 3 years ago. Operation revealed a fistula in the cæcum 2 x 3 cm., and this was sutured with silk, over which was sutured an epiploic appendage.

The other patient, a male, was also operated on elsewhere 9 months previously for appendiceal abscess, and developed 9

days later intestinal obstruction requiring re operation Four days after this second operation a fæcal fistula developed at the incision of the first operation in which a glass tube had been used The second incision had been sewn up and was already healed Operation revealed a fistula in the cæcum 1 cm from the ileocæcal valve The opening was closed with silk reinforced by an epiploic appendage The congested swollen and adherent appendix was removed and the stump retained in invagination by a silk purse string suture

URINARY ORGANS—*Wandering Kidney*—There were 5 cases 1 in a male 4 in females all on the right side One patient had suffered for 2 years since being thrown from a wagon striking on her right side This kidney movable to the third degree was sutured by a modified Edebohl's method

The second case occurred in a single lady aged 43 who 5 months previously had experienced pain and sensation of discomfort in the right side after having lifted her invalid mother Three months later the patient had an attack of acute appendicitis At the operation the wandering kidney was anchored by a modified Edebohl's method and the chronically inflamed appendix removed

Another patient had complained for 3 years of pain below the right costal margin The third degree kidney was hammocked with gauze

Associated with pyonephrosis was a freely movable kidney in a female aged 36 that had existed 18 months To the ordinary symptom of dull aching pain in the right side were added a month before operation frequent painful and scalding urination Examination revealed a movable tumor in the right loin space excoriation of the external urethral orifice and retroflexion of the uterus The Israel incision revealed an enlarged grayish lustreless kidney the pelvis and parenchyma of which were the seats of multiple abscesses The kidney with 10 cm of the ureter was extirpated

The fifth patient had been operated on at different places for various abdominal conditions 11 times during the previous 14 years One of these operations 9 years before admission consisted in anchoring the right kidney with silver wire The patient had an attack of Ditell's crisis 7 and another 4 months previous to operation which revealed a small cyst at the lower pole of the

wandering kidney. The cyst was evacuated, and the kidney ham-mocked in gauze.

Ureteral Calculus.—Two cases of ureteral calculi, both of whom were females who had suffered frequently from severe attacks of renal colic for 10 years. In each case the right kidney was involved and removed. Operation revealed in one a right wandering kidney, of which the pelvis was diseased and contained a calculus. In the other patient there was a small calculus situate one inch below the pelvis, and immediately beyond it the ureter for a distance of about one inch was the seat of a fibrous stricture; microscopic examination revealed chronic pyelitis with early malignant proliferation. Both patients recovered.

Vesical Calculus.—This man, aged 56, during the past 11 years had had numerous attacks of renal colic in the left lumbar region, radiating to the groin and genitals. He had passed a number of calculi, and at one time, 3. The last attack occurred three weeks previous to operation, the patient feeling the calculus passing to the bladder. During urination the stream would stop suddenly. The calculus was removed by suprapubic lithotomy, and the bladder drained by a rubber tube. The pre-operative cystitis from self-catheterization subsided, and the urine was normal on discharge 60 days after operation.

Dorsal Neuritis.—This patient, a woman aged 30, had been operated on elsewhere 2 years previously for right wandering kidney. Since the operation the patient had suffered from griping, dragging pain in the right lumbar region in any position she assumed. The pain radiated down over the right buttock. The diagnosis of chronic neuritis of the lateral cutaneous branch of the last dorsal nerve was made. At operation, after removing the scar, this nerve was dissected out and excised for a length of 5.5 cm. The patient was discharged, cured.

BREAST.—Carcinoma of the Breast.—There were 8 cases of mammary carcinoma, 1 in a male, and 7 in females. The right breast was affected in 6, the left in 2. Two of the women gave a family history of cancer, and 1 a history of trauma. Halsted's operation was performed in the 4 favorable, and simple removal of the breast in the 4 unfavorable cases.

The male patient, a tailor aged 48, had had a small lump in the right breast for 10 years. This caused no disturbance until

it began noticeably to grow 6 months before operation. Examination revealed a hard, irregular, non encapsulated tumor the size of an egg, which was adherent and ulcerated. The nipple was retracted. Owing to his occupation, the breast alone was removed.

UTERUS AND APPENDAGES—*Uterine Fibroids*—There were 7 cases of uterine fibroids, in 6 of which abdominal and in 1 vaginal hysterectomy was performed, in 4 patients, all past the menopause, the hysterectomies were complete. Of the 2 incomplete, in 1 there was added a left intra-ligamentary cyst and a chronically inflamed appendix, in the other, the diseased right tube and ovary were removed with the uterus. The vaginal hysterectomy was performed in a patient aged 63, with Pryor's clamps. The clinical diagnosis of fibroids were all confirmed by microscopical examination.

Carcinoma of the Uterus—There were 6 cases of carcinoma of the uterus, 2 involving the cervix and 4 the body of the organ. Complete abdominal hysterectomy was done in 5 cases, and vaginal hysterectomy, using Pryor's clamps, in one case. The youngest patient was the case of vaginal hysterectomy for squamous epithelioma occurring in a Polish woman aged 26 years.

In addition to the above cases of hysterectomy for carcinoma there were 5 cases of complete abdominal hysterectomy for infected uteri, one of which was complicated by a papilliferous adenomatous cyst of the ovary and a chronic appendicitis, the appendix was also removed.

Retro-Displacements of the Uterus—Retroversion was present in 4 cases, and was corrected in 1 by Alexander's extraperitoneal, and in 2 by Tuffier's intraperitoneal shortening of the round ligaments, in 1 of the latter both ovaries and the left tube being diseased and removed. In another Mann's operation was performed.

A prolapsed uterus of 2 years' standing caused by a laceration of the perineum, was corrected by ventro-suspension and perineorrhaphy.

Extra Uterine Pregnancy—This interesting condition occurred in 6 patients, whose ages ranged from 20 to 35. Of these, 3 were primiparae, 2 had borne children 6 years previously, and 1 had had 3 miscarriages. Two patients experienced sudden, sharp, cutting pain in the pelvis, one of whom fainted. Five of

the 6 gestations were right-sided and ruptured, and the other unruptured on the left side. Five were tubal and 1 tubo-abdominal. Three of the patients were irrigated with saline solution and drained by a glass tube in the pelvis, 2 were not drained, and 1, in whom a large cyst was found on the opposite side, was drained with gauze.

Diseases of the Tubes and Ovaries.—There were 7 cases of pyosalpinx, 4 bilateral in one of which the appendix was involved; 1 right sided in which the appendix was involved, and 2 left sided. Of 3 cases of chronic right-sided salpingo-öophoritis, the appendix was involved in one; 2 other cases were on the left side. Both ovaries were cystic in 1 case, and the left in another. There were 2 cases of left-sided ovarian cyst, in 1 of which was a small dermoid.

In addition to those operations described above, the following less interesting were performed at the clinics:

Abortion (curettage)	1
Abscess, perichondrial (post-typhoidal)	1
Abscess, ischio-rectal	1
Abscess (peri-urethral)	1
Adenitis, axillary, tubercular	1
Adenitis, cervical	2
Adeno-fibroma, breast	1
Adhesions, abdominal	2
Arthritis, knee, tubercular (excision)	1
Arthritis, carpi, tubercular (amputation)	1
Atresia of cervix	1
Carcinoma of cæcum (resection, ileo-colostomy).....	1
Carcinoma of sigmoid (ileo-sigmoidostomy).....	1
Carcinoma of tongue (unilateral excision).....	1
Cyst, suprahyoid	1
Cystotomy, suprapubic, for tuberculosis of bladder.....	1
Empyema	2
Endometritis (curettage)	3
Fissure-in-ano	5
Fistula-in-ano	1
Fracture of tibia and fibula, comp. and commin. (amputation)	1
Goitre, cystic (unilateral thyroidectomy)	1
Hæmorrhage, secondary following an abdominal section.....	1
Hæmorrhoids (clamp and cautery)	4
Hydrocele (radical)	3
Hypertrophy of cervix (amputation).....	1
Lacerated cervix (trachelorrhaphy)	1

Lacerated perineum (Emmet)	3
Lipomata	2
Myxofibroma abdominal wall and ileum (enterectomy)	1
Neuralgia, tri facial (neurectomy)	1
Retained secundines (curettage)	3
Sarcoma of back	1
Sarcoma of parotid (extirpation)	1
Stricture urethral (dilation and perineal section)	4
Supernumerary toe	1
Ulcer of leg, traumatic (excision and curettage)	1
Urethral caruncle	1
Varicocele	2
Varicose veins of leg (phlebectomy)	2
	<hr/>
Total	64

The deaths were Acute appendicitis, 1, Carcinoma of *cæcum*, 1, Carcinoma of *tongue*, 1, Carcinoma of *pylorus* and *pancreas*, 1, Carcinoma of *sigmoid*, 1, Cholecystitis, 1, Empyema, 1, Tuberculosis of *bladder*, 1, Ulcer of *stomach*, 1

GLANDERS IN THE HUMAN SUBJECT.

CLINICAL REPORT OF TWO CASES OBSERVED IN THE FOURTH MEDICAL DIVISION
OF BELLEVUE HOSPITAL OF NEW YORK.

BY JAMES TAFT PILCHER, M.D.,

OF NEW YORK.

CASE I.—B. C., age 30, Russian, stableman, was admitted to Bellevue Hospital, December 31, 1905, with the following history:

Six weeks previous to admission he was bitten in the thigh by a horse, which at that time was apparently healthy and has remained so. Two weeks later a new horse was purchased, which was taken ill in a few days and was attended by patient; after a week the horse was shot by order of the Board of Health, having developed cutaneous nodules and many points of superficial ulcerations; diagnosis, glanders.

Three days previous to applying at hospital the man went to work feeling perfectly well. During the afternoon he was seized with sharp, stabbing pains in left chest, posteriorly, which increased on deep inspirations; shortly afterward he had a short, dry cough; sputum normal, moderate dyspnoea, and increasing pains in left side. These symptoms becoming more insistent, he presented himself at the hospital and, on examination, showed:

A well-developed and well-nourished male; apprehensive and flushed facies; rapid, shallow, grunting respiration; skin hot and dry; general appearance of one acutely ill.

Lungs: Over left lobe, dulness; absent, vocal fremitus; diminished breath sounds and many coarse, crepitant rales. Otherwise negative, especially pharynx, nose and skin.

Appended is record of bedside notes, made by the writer, which will indicate the progress of patient's illness more in detail.

December 21.—Patient admitted. Temperature 103; pulse 104; respiration 28; with considerable oedema of lungs; under active and continuous stimulation and radical use of vaso-constrictors, this condition was relieved.

December 22.—Looks very ill; more so than would be indi-

cated by his physical signs Temperature 103, pulse 120, respiration 52 Acts apprehensively, and is resistive on being moved

December 23—Pulse and respiration continue rapid, temperature rising Complains of a good deal of deep-seated pain, no external evidences Lung signs unchanged

December 24—During past twenty four hours has been semi-delirious, and so restless that restraint has been adopted

December 25—Prostration progressive Right knee held flexed, and is painful to palpation, is slightly swollen

December 27—Patient seldom moves, seems to have generalized pains Right knee joint more swollen, back of right hand and outer aspect of ankle tender to touch

December 30—Right knee markedly swollen Right hand and left ankle reddened, painfully hot Pain on pressure over extensor muscles of legs and flexors of both arms, particularly right

January 2—Multiple tumefactions appearing on thighs, arms and legs, condition of ankle, knee and hand progressively worse General condition critical, temperature, pulse, respiration going up Breathing shallow, with inspiratory and expiratory stertor, is in great pain, dyspnœa increasing and more difficult

January 3—Died 1 A M Seemingly septic

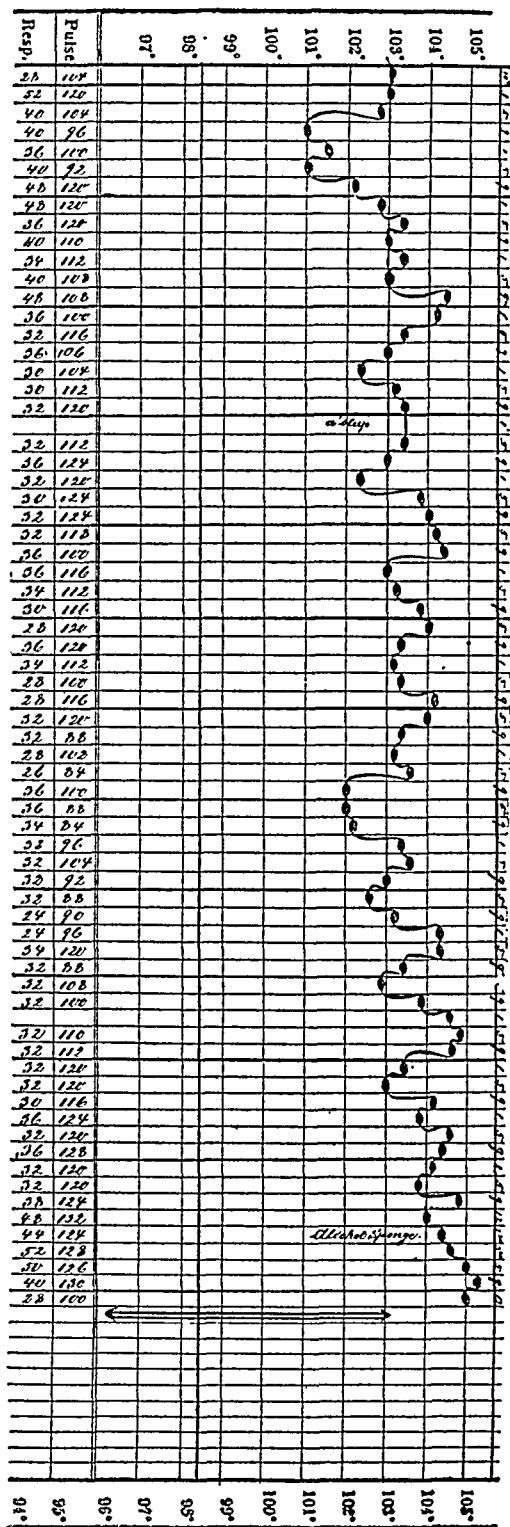
(See Chart A)

Clinical Pathology—On admission, white blood corpuscles 14 700, following day, 14,700, December 29, 13 700, ante mortem, 19 500

December 30—Widal examinations with negative results

December 31—Blood culture, showed at end of forty-eight hours on blood agar plates numerous deep and superficial colonies, about 35 to a plate, the superficial ones being raised, whitish, opaque and viscid The flasks showed a flocculent sediment which, on examination, showed a small, slightly bent, irregularly stained gram negative bacillus, strongly suggesting *B mallei* Sub-culture on potato showed, after a few days, a characteristic raised viscid, brownish growth

Post-mortem examination, made ten hours after death, by Dr Pappenheimer, showed a moderately well nourished male, about 35, of medium frame Small, superficial abrasion covered by scab, no area of inflammation, on external surface of right thigh. Over both arms, on dorsum of right hand, over left thigh



on external surface, and scattered irregularly over rest of body, are a number of deep seated nodular swellings, showing as diffuse, rounded prominences of the skin, without external signs of inflammation. Section shows them to correspond to abscesses localized chiefly within the muscles and deeper layers of the corium. The abscesses contain a thick, yellowish white or brownish pus. There is apparently entire absence of inflammatory reaction about them, neither granulation tissue nor hyperæmia. Right knee swollen, on section, exudes thin, purulent fluid. Swelling over third right metacarpo-phalangeal joint, incision followed by escape of thin pus. Left lung adherent over the lower half of lower lobe to the chest wall. Right lung free.

Lungs—Left lung over lower portion of lower lobe, the pleura is thickened showing patches of firmly adherent fibrin and superficial circular yellowish abscesses. Bronchial lymph nodes are small anthracotic, and the seats of calcareous deposits. Bronchi contain frothy fluid, otherwise normal. Parenchyma of the lung save for moderate œdema, normal. Right lung shows moderate œdema.

Spleen—Slightly enlarged capsule tense. On section it is somewhat softer than normal, pale in color, no undue prominence of Malpighian bodies or trabeculae.

Larynx—Left aryteno epiglottic fold and the mucous membrane in the pyriform fossa on the left side are markedly œdematous. There is a fine erosion of the left cord. The anterior wall of the larynx, just below the rima glottidis, shows a group of small submucous abscesses which exude thick yellowish white pus. These show no surrounding inflammatory reaction. M. M. of trachea elsewhere normal.

Stomach—Shows numerous ecchymoses, slight swelling of the mucous membrane, in the pyloric half the mucous membrane is mammillated, this condition is marked also in the first portion of the duodenum. The heart, liver, pancreas, adrenals, kidneys bladder and ureters pharynx, small and large intestines, thyroid and brain are negative to any essential gross changes.

Anatomical Diagnosis—*Pyæmia (glanders) and abscesses of muscles pleura and laryngeal mucous membranes*—Smears were made from the laryngeal abscesses and from several of the subcutaneous lesions. Cultures were made from the spleen and from the pus in a deep nodule in the right arm. A guinea pig was

injected intraperitoneally with a broth suspension of pus from a subcutaneous abscess. The *B. mallei* was obtained in pure culture from the spleen and abscess, and bacilli having characteristic morphology and staining reaction were seen in smears from the pus.

The guinea pig showed, after twenty-four hours, slight swelling of the testicles which, at the end of seventy-two hours was very marked, the overlying skin being hot and glazed. Three days after injection the pig was killed; autopsy showed superficial abscesses in the seminal vesicles, and intense fibrinopurulent inflammation of the tunica vaginalis which was studded with small miliary abscesses. The testes proper were swollen to about twice their normal size. There was no peritonitis. Pure cultures of *B. mallei* were obtained in streak plates on glycerine agar from the peritoneal cavity and the tunica vaginalis.

CASE II.—H. M., age 55, stableman. Patient was admitted to Bellevue Hospital, April 4, 1905, in a delirious condition. No history was obtainable other than that he had been bitten on the top of the head about a week previously, and that for the last few days before admission his right arm and shoulder had become painful and swollen, and that he had become feverish and weak.

On examination, a well-developed and well-nourished male presented himself, apparently acutely ill; skin hot and dry, capillary ectasia over both cheeks and nose, ecchymosis under right eye. Spastic condition of right arm which, together with right shoulder, was greatly reddened, œdematous and very tender. On vertex of cranial vault is a small scalp wound about which the skin extending out in all directions is swollen, red, indurated and œdematous; the edges are irregular and separated from the healthy tissue by an abrupt stump edge. Further examination is negative other than the signs of a moderate bronchitis, and a generalized neuritis, pain on pressure being especially marked.

On April 7, forty-eight hours before death, a generalized pustular eruption was noticed, particularly over forehead, face, neck and right forearm. These foci showed only in a very few instances, as was noted also in Case I, the purplish hyperæmic areola about them, which is supposed to be so characteristic of the infection of glanders. Smears were immediately taken from the pus, and showed bacilli having characteristic morphology and staining reaction of the *B. mallei*. A guinea pig was injected

intraperitoneally, and showed the successive phenomena typical of this infection in these animals, as was described under Case I. Clinically, the patient simulated the condition of the first patient. The temperature, pulse and respiration ran along in the same ratio and degree. His leukocytes, on day after admission were 10,000, red corpuscles 5 000,000, hæmoglobin 90 per cent and differential, neutrophils 80 per cent, mononuclears 4 per cent, lymphocytes 16 per cent, eosinophiles 0. Urinary examination in both showed a fairly typical degree of acute toxic nephritis.

(See Chart B)

Post mortem, done a few hours after death showed on scalp over parietal and anterior occipital region a central defect covered with dried scab, around this an area four inches across with numerous prominent, yellowish foci, one third mm in size.

Over forehead are noted elevations, 1 mm to 1 cm in diameter some with yellow head, and others open over the dome of the prominence. One on right eyelid, one on left cheek, several on neck and supraclavicular region, a large one 2 inches in diameter over lower end of sternum, fluctuating at centre, yellowish, surrounded by red zone, on incision, brownish thick pus.

On sides of abdomen were small nodules, right forearm abscess in muscle, on inner surface right thigh, also nodule of same type as in forearm.

Under area of abscess described on lower end of sternum the bone shows yellowish infiltration of cancellous tissue, mediastinum shows quantity of yellowish brown pus.

Head—On section of scalp through area above described the foci of suppuration are seen to extend down to the pericranium, the cellular tissue of the scalp which is the seat of multiple abscesses, is œdematous, over the frontal bones just superficial to the pericranium are several groups of small yellowish foci, each surrounded by a hyperæmic zone, calvarium normal.

Heart—A few ecchymoses on pericardium especially over left ventricle, muscle dark red.

Lungs—Right apex adherent by old adhesions. On section, are seen numerous pustular foci, up to 3 cm, which on their pleural surface show yellowish centres with numerous smaller yellowish, pustular foci surrounding them, bounded by a hyperæmic zone. Left presents the same lesions.

Tonsils enlarged to two thirds cm, œsophagus normal. On

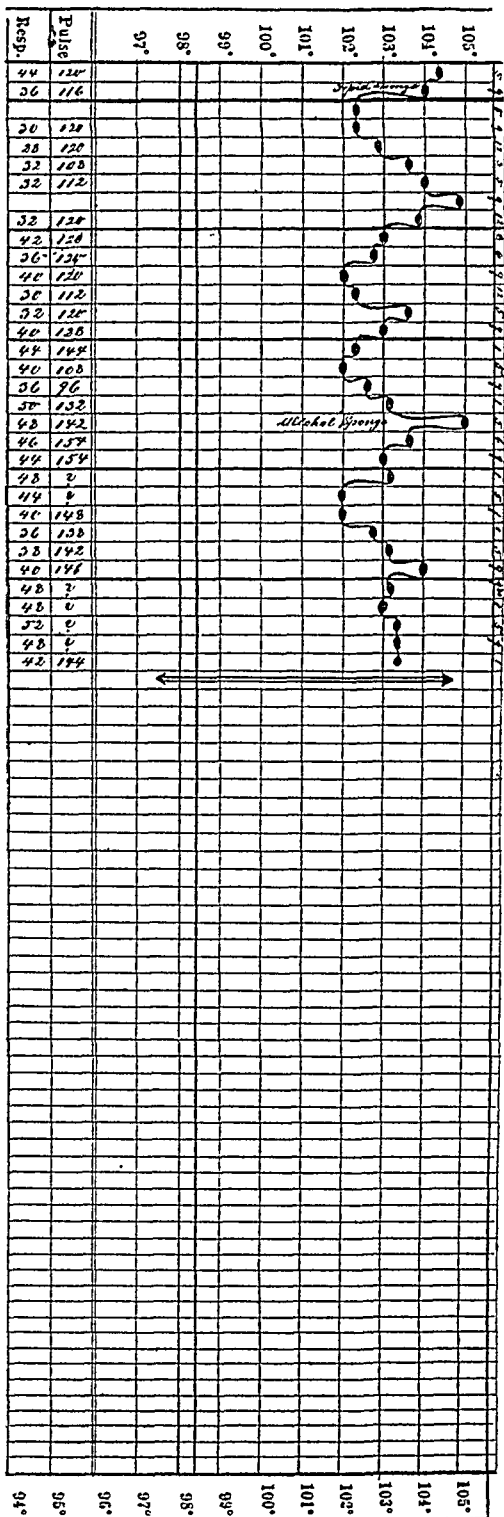


CHART B.

posterior wall of pharynx, on ary epiglottic fold, in pyriform fossa, on epiglottis, farcy buds up to 6 mm in diameter Tracheal and bronchial mucosæ normal

Spleen—Shows moderate degree of septic softening

Stomach—Mucosa is ecchymotic

Kidneys—Lesions of acute parachymatous nephritis

Intestines—Mucosa congested

Other viscera negative to gross changes

REMARKS

Beyond question the infection in Case I occurred through inhalation In Case II inoculation through the scalp wound was the probable cause However, though infection occurred differently in both cases the ultimate symptomatology and clinical findings show a marked similarity In Case I the incubation period was 25 days, course before fatal termination, 13 days In Case II the incubation was only 5 days, while the course before death was only 9 days, showing a variability in the length of time elapsing between infection and exhibition of symptoms, due, it may be inferred, to the mode of infection in conjunction with the virulence of the infecting organism

In both cases the striking thing is the fact that the degree of prostration is greatly out of proportion to the physical signs, in both there were the signs of a diffuse bronchitis, more marked in the first case Both cases exhibited the signs early of muscular pains, probably caused by the early formation of deep abscesses The most striking phenomenon is the early involvement of the various larger joints of the body

There seems to have been no exhibition of lymphatic involvement The glandular nodules or pustules, in both cases, became a terminal development The historical bluish red areola about the cutaneous nodules was lacking in both cases, Clinically, is noticed the sustained temperature curve and the disproportion between the temperature, respiration and the pulse, the latter being, in both cases, much lower during the majority of the course than would be accounted for by the extreme degree of temperature and the acceleration of respiration

tion, the latter tending to make one infer that the disease involved the respiratory apparatus.

Clinically, the most noteworthy phenomenon is the relatively low leukocyte count, in the first case varying from 14,700 to 13,700 per cm., with an ante-mortem rise to 19,500 per cm. In the second case, at the very height of the disease, the count was but 10,000 per cm., while the differential count does not show any particular inflammatory reaction; which observations, in themselves, taken together with the extreme grade of obviously septic involvement, would tend to make one suspicious of the infecting agent immediately.

Fresh blood preparations allowed to coagulate, the supernatant serum being removed, tests similar in execution and technique to the familiar Widal reaction are found, in the case of the *B. mallei*, to cause a similar agglutinative reaction.

TRANSACTIONS

OF THE

NEW YORK SURGICAL SOCIETY.

Stated Meeting, December 12, 1906

The President, Dr GEORGE WOOLSEY, in the Chair

SUPPURATIVE SYNOVITIS OF THE KNEE.

DR CHARLES H PECK presented a man who had been subjected to a transverse incision into the knee joint for the relief of suppurative infection. The case is reported in detail in the paper on page 409.

DR JOHN A HARTWELL presented a man, forty eight years old, who was admitted to the Lincoln Hospital in May, 1903 suffering from an injury to the right leg, a heavy box having fallen directly across it. Examination showed a fracture of the tibia just below the head of the bone and a severe contusion of the joint itself. In the course of a few days the knee joint showed evidences of infection, with the usual septic symptoms. The infection was possibly due to the fact that the joint had been aspirated in order to relieve the tension.

As the septic symptoms increased in severity, a transverse incision was made across the joint, and the patella turned upwards. The ligaments, however, were not divided, as Dr Peck had done in his case, and it was perhaps owing to that fact that the outcome of the case was not more favorable. In spite of the free exposure of the joint and thorough irrigations twice daily, with the knee flexed and the patellar flap drawn well upward, the case ran a very septic course, which continued for five or six weeks. The fracture of the tibia was a complication which rendered the treatment more difficult. The patient suffered much pain. Several ineffectual attempts were made to suture the patella back into

position, but each time the recurrence of the suppurative process underneath the bone would interfere with its reposition.

Ultimately the crucial ligaments and most of the lateral ligaments sloughed away so that a backward dislocation of the knee took place. Dr. Hartwell was inclined to think that a better result would have been obtained if the joint had been opened by free lateral incisions placed as far posteriorly as possible.

As a result of the injury and the prolonged suppurative process, the patient now had a stiff joint, with a good deal of deformity, but this did not interfere with his occupation as a shoemaker, and he was well satisfied that the limb was not sacrificed.

DEFORMITY OF THE SHOULDER JOINT.

DR. HARTWELL, through the kindness of Dr. A. S. Vosburgh, presented a girl of twelve, who three years ago was successfully treated by Dr. Lorenz of Vienna for a congenital dislocation of the hip. About a year later she awoke one morning, complaining of a disability of the right shoulder. There was no history of a fall or injury, and the function of the joint prior to that time had apparently been normal, although the child's parents had noticed that she usually slept on the right side, with the shoulder deeply burrowed in the mattress.

Since the onset of the trouble, two years ago, the disability of the joint had steadily increased. At the present time the acromion was very prominent, and there was distinct atrophy of the deltoid muscle. There was no reaction of degeneration in the muscle, and a certain amount of power still remained. There was practically no motion in the shoulder between the humerus and scapula. There had never been any pain. The shaft of the humerus was apparently normal, but the head of the bone seemed to be out of position. The humerus was nearly an inch shorter than on the normal side.

Dr. Hartwell said the patient had been examined by a number of surgeons and orthopædists, and various views had been expressed as to the nature of the condition. Some regarded it as a dislocation, others as a fracture of the anatomical neck of the humerus.

In connection with this case, Dr. Hartwell showed a radiograph of the shoulder taken by Dr. Wisner R. Townsend in February, 1906, and one taken at Bellevue Hospital in December,

1906 Dr Hartwell had diagnosed tuberculosis of the humerus and advised operation, but this was refused because of the conflicting opinions which had been expressed by the different surgeons who had seen the joint

DR ROYAL WHITMAN did not think there were any evidences of a fracture. He regarded the case as the result of disease, the head of the bone having been destroyed by granulation tissue, "caries sicca". The process was probably of several years' duration. Cases of this character in which the progress in limitation of motion, stiffness, pain and resulting atrophy did not attract especial attention for a long time were not at all uncommon.

DR V P GIBNEY said he was inclined to agree with Dr Whitman that the case was one of tubercular osteitis of the shoulder joint, probably having its origin in early life. These cases, the speaker said, frequently went unrecognized until several years after the onset of the disease. In reply to a question as to the most favorable method of treatment, Dr Gibney said he would suggest an arthroplasty, which might increase the range of motion. The operation was comparatively new, consisting of removing through long incisions the contracted tissue such as capsule and new bands followed by the interposition of fascia covered with fat, taking from the muscles, covering the bone eroded of cartilage with this fatty tissue—the object of which clearly was to prevent subsequent synostosis.

DR HARTWELL, in closing, said he had been inclined to regard the case as one of tubercular disease of the shoulder, but there had been so many conflicting opinions that he had deemed it advisable to present the case for diagnosis.

STATUS OF A CASE FOUR MONTHS AFTER RIGHT NEPHROSTOMY

DR F TILDEN BROWN presented an unmarried woman, forty eight years old, who for two years had suffered from hæmaturia. She was first seen by Dr Brown with Dr Galbraith on July 15 1906, at which time cystoscopy showed a bleeding neoplasm the size of a large hen's egg.

After the patient's admission to the Presbyterian Hospital, on July 20, three weeks were devoted to local and constitutional treatment in order to fit her for an operation, but her anæmia and

emaciation increased. The hæmaturia, foul cystitis and general sepsis were but slightly improved, her temperature frequently going up to 105. There was a tumor of the bladder which involved enough of the right vesical wall and the vesical portion of the right ureter to require such an amount of cystectomy as would cripple the corresponding kidney unless its damaged outlet was compensated for in some way. For this reason, lumbar drainage seemed better than ureteric transplantation to some other portion of the bladder, because a recurrence of the neoplasm might demand a subsequent and more extensive cystectomy. Consequently, on August 11, a right nephrostomy was done, which comprised placing two chromic ligatures on the ureter, an inch or so below the renal pelvis, and severing it between them; then making a punctured opening for a soft rubber angled catheter from the convex surface of the kidney into its pelvis. To do this in a normal kidney in which the pelvis was of course a small collapsed space, was attended with considerable difficulty and uncertainty unless the finger was called into requisition; needless to say, the finger was disadvantageously large. For this purpose, the proper resource was a probe to be passed into the proximal end of the severed ureter, and advanced through pelvis, calyx, parenchyma and capsule; then the probe tip was to be seized by dilating forceps, which were led back into the pelvis as the probe was withdrawn. Now, withdrawal of the partly opened forceps would afford a safe and adequate tunnel for the catheter.

After the drainage catheter was adjusted in the kidney, the fibrous and fatty capsule immediately surrounding the catheter were united to the wound opening in the upper angle of the lumbar fascia, for the purpose of coupling the parts and maintaining the future sinus in as direct a line as possible to the surface; the catheter was secured in place also by a silk suture to the skin.

By September 4 the conditions connected with the nephrostomy were satisfactory enough to justify operation for the bladder tumor, although the patient was in much the same septic and debilitated state, due to the putrid cystitis and the bleeding from the necrotic tumor.

With the patient in partial Trendelenburg posture, a suprapubic cystotomy was done, which disclosed a soft tumor, two

inches in diameter, with adherent blood clot and necrotic filaments. Its pedicle involved the bladder wall for an inch or more, and was in touch with and just below and behind the right ureteral mouth. To secure space for dealing with the bladder wall the tumor was ligated as closely as possible, and cut away. An elliptical section of the bladder wall was made well beyond the margin of the pedicle, this, as had been anticipated, involved the intra muscular portion of the ureter. The wound was approximated by chromic sutures in layers. The intravesical part of the operation, particularly the suturing, was materially facilitated by having the bladder floor lifted well up by an assistant's finger in the rectum, and by the illumination afforded by a small cold electric lamp passed through the urethra and held just clear of the internal meatus. Before closing the bladder wound of entrance, a soft rubber two eyed catheter, led through the urethra, was secured in the most favorable position. The parietal wound was closed in the greater part, space being left for wick drainage of the perineal space.

After the operation, convalescence was very slow but nearly constantly progressive. On October 31, 1906, the patient was discharged practically well, and already quite competent to care for the lumbar drainage catheter and the glass urinal suspended at the waist into which the catheter led the urine from the right kidney. There was no wetting of her clothes or body day or night. She removed the catheter daily for boiling. At the time the patient was shown by Dr. Brown, the urinal contained about two ounces of clear urine. She had regained her lost weight. She had just menstruated for the first time in six months and was able to perform all her duties as a housemaid.

In referring to the drainage tube in the kidney, Dr. Brown said it should be a right angled soft rubber, two eyed catheter, of from No. 18 to No. 22, French size. The short arm of the catheter was just long enough to reach from the skin margin of the fistula to the centre of the renal pelvis. This distance would vary in different individuals. A catheter of the exact size could be specially moulded at slight cost. The ordinary straight catheter would not be satisfactory for several reasons, one being that the pressure of the clothing would give it such a sharp angling or bend as to occlude its lumen.

DR. CHARLES L. GIBSON suggested that the woman's con-

dition might be made more bearable by removing the kidney. Anything, he thought, was preferable to this method of draining the kidney externally.

DR. BROWN, in reply to Dr. Gibson, said he did not see that enough would be gained by removing the kidney to justify it. The sole advantage would be to save the patient the trouble of caring for her catheter and wearing a urinal, especially in view of the even remote possibility of a nephritis developing on the opposite side. It was preferable, he thought, to have two sound kidneys, even with one of them draining into the loin than to have but a single sound kidney. Experience seemed to show that by this external method of drainage, the kidney was not exposed to the same danger of infection as it was when the ureter was sutured into abnormal positions.

In reply to the query as to whether there was much danger of the kidney becoming septic, Dr. Brown said there was less danger of this by the external method of drainage than there was when the ureter was transplanted into the bowel. Of course, the transplantation of the ureter into another section of the bladder was the ideal operation, but it was more theoretical than practical. Stricture formation, cystitis and disturbances of the urinary function were not infrequent complications of such successful anastomoses; moreover, the immediate risks that attended the success of implantation itself were not inconsiderable.

Dr Brown said he was interested in the ultimate outcome of the kidney drainage in this case. While the presence of the catheter in the pelvis of the kidney was doubtless a source of more or less irritation and chronic pyelitis, it had thus far in this case given no evidences of that fact. The smooth and perfect condition of the eye-end of the catheter is of importance in guarding against this possibility.

DR. CHARLES H. PECK said that he had recently seen a case where he had been obliged to resort to permanent lumbar drainage of the kidney as a life-saving measure. The patient was a woman who some time after a nephrectomy had an attack of complete urinary obstruction on the opposite side. A nephrotomy was done, and about 750 cc. of turbid urine withdrawn from the pelvis. The condition of the patient was such that a prolonged operation was not deemed advisable at the time, but it was concluded that the obstruction to the outflow of urine was due to a

kink in the ureter After this operation, a ureteral catheter was introduced, through which there was free drainage, in addition to the lumbar drainage, but when the ureteral catheter was withdrawn five days later, no urine passed spontaneously The quality of the urine drained through the loin gradually improved, and then the question came up of re-establishing the patency of the ureter A ureteral catheter was again introduced, with a similar result The kidney was again exposed with considerable difficulty, on account of the adhesions left by the previous operation, and a kink in the ureter was found near the junction of the ureter and pelvis It was impossible to correct this, and a plastic operation on the ureter similar in plan to the Finney pyloroplasty was performed While apparently satisfactory at the time of operation the result proved unsuccessful Permanent lumbar drainage was then resorted to as the last expedient The operation was done on October 1, 1906, and when Dr Peck last saw the patient, four weeks ago, the condition of the kidney was fairly good He asked Dr Brown whether permanent lumbar drainage of the kidney was compatible with prolonged life?

DR BROWN said he could not answer Dr Peck's question from personal experience Dr Watson of Boston had reported a case of double nephrostomy in a patient upon whom the operation was done eight or nine years ago, and who was still able to carry on the functions of an active business life without his associates even suspecting that he was wearing lumbar drains and urinals According to Dr Watson, these lumbar fistulæ showed no tendency to close In fact, such would be impossible since the patency and even the continuity of the ureter was purposely sacrificed at the nephrostomy operation In his own case, Dr Brown said, the patient had gained many pounds in weight since the operation She was a mere skeleton when she entered the hospital, and did not offer a very hopeful prospect of bearing a serious operation Her menstrual periods which had been in abeyance for eight or nine months prior to the operation, had returned The speaker said that if he had known beforehand that a favorable report on the nature of the bladder growth would have been rendered by the pathologist, he would have been inclined to do a less radical operation, and would have limited himself to removing the tumor and leaving the bladder wall intact Of course, the preliminary nephrostomy would not have been done

DR. WOOLSEY said that in one case of accidental division of the ureter he had had very good success follow the implantation of the ureter into the bladder. The operation did not seem to be attended by any great degree of risk.

RENAL HÆMATURIA: NEPHRECTOMY.

DR. F. TILDEN BROWN presented a married woman, forty-seven years old, who came under observation on September 24, 1906, complaining of hæmaturia and right lumbar pain. Her father died of heart trouble. Her mother had long suffered from rheumatism. Two sisters died of pulmonary tuberculosis and the patient had a son who was suffering from that disease.

Personal History.—The patient had typhoid fever 19 years ago, and two years ago she gave an indefinite history of pneumonia. She had long suffered from severe, intractable headaches, and for many years she had had "stomach trouble," with vomiting after meals. She also complained of pains in the right lower abdomen and lumbar region on both sides, radiating along the thighs to the knees. These pains were of an indefinite character and so severe that they would often confine her to bed in the morning, abating in the afternoon. The pains were aggravated by riding on a street car, and were usually eased when in a sitting position by crossing the right leg over the left knee.

Some months ago the patient had an unusually severe attack of this pain, which kept her in bed for two weeks. There was no history of chills or fever. There was urinary frequency at times, and pain at the beginning of the act. In July, 1906, she had a severe attack of diarrhœa and cramps, and during the summer she lost considerable weight. There was no history of jaundice nor dropsy.

Nine days before coming under observation the patient first noticed that there was blood in the urine. This was subsequently verified by passing the urine into a glass. No clots were noticed. That evening she had a violent attack of vomiting and pain in the right lumbar region, high up, and radiating down the side toward the groin and across the back. Since then, every passage of urine had been bloody. There had been only slight frequency and pain on urination. The hæmaturia was not influenced by rest or posture. There had been frequent recurrence of the vomiting.

The patient was admitted to the Presbyterian Hospital on

September 28, 1906 Physical examination showed a well-nourished woman. She was slightly anæmic, but did not look very ill. Her chief symptoms were hæmaturia, and pain in the right lumbar region. An examination of the abdomen was practically negative, although upon bimanual palpation there was an indistinct sense of a mass in the right flank, which descended from beneath the costal arch on deep inspiration. The character of this mass could not be made out.

An examination of the separate urines showed bloody urine from the right ureter, while that from the opposite kidney was practically normal. Cultures made from the urines of both kidneys remained sterile. An X-ray examination gave negative results.

The case was regarded as one of hæmaturia of undetermined origin, and on October 1, 1906, the right kidney was exposed. The kidney was of normal size, and in fairly good position. The surface of the kidney was somewhat lobulated, and disclosed three reddish areas which were slightly raised above the level of the surrounding kidney tissue. Dr. George A. Tuttle, the pathologist of the hospital, thought they were infarcts, although not typical of that condition. The kidney, as well as the pelvis and ureter were thoroughly explored, with negative results. Although no calculus nor other abnormality was found to explain the hæmaturia, removal of the kidney was deemed essential, and this was done after opening the peritoneum and examining the adjacent abdominal organs. These showed no abnormalities.

The woman made a rapid recovery after the operation, and left the hospital on October 27. There had been no recurrence of the hæmaturia. The pathological report of the excised kidney had not yet been satisfactorily completed.

TRANSVERSE INCISION OF THE KNEE JOINT FOR DRAINAGE IN SEVERE INFECTIONS

DR. CHARLES H. PECK read a paper with the above title, for which see page 409.

DR. ROBERT F. WEIR said that in the two cases observed by him comparatively recently, which were referred to by Dr. Peck, and in which he had confined himself to the repair of the damage done to the joint by the disease and by the surgical efforts required to control the ensuing sepsis, his attention had been strongly

attracted by the difficulties that were encountered in bringing about a proper ambulatory support. So far as he then knew, only a resection of the joint along ordinary lines would answer, but this was not an easy matter in a child, where one is limited to the removal of quite a narrow margin of bone in avoiding the epiphyseal line, while the sub-luxation and the contracted tendons demanded a considerable space for the proper apposition of the denuded bone surfaces. Moreover, the turned-up flap of the patella and its coverings will not readily come down, and the replacement of the flap is only to be effected by taking out the patella and freely loosening the adjacent skin from its subjacent attachments. However, Dr. Lilienthal's method of removing the patella and splitting the flap at the time of employing the drainage might possibly do away with that difficulty.

Dr. Weir said that on referring to the original report of this method of drainage by Dr. Charles H. Mayo, he found that he simply cut freely through the patella, and thereby widely opened the joint, which was irrigated and packed with gauze, and the limb fixed on a splint. Subsequently, an article on this subject was published by Dr. William J. Mayo, in which he advised the transverse incision to go lower down, so as to divide the patellar ligament. No statement was made, however, about dividing the lateral or crucial ligaments, and nothing was said in regard to elevating the patellar flap. In that article, however, Dr. Mayo stated that he re-sutured the divided patellar ligament at the end of several weeks, and that particularly in children he was able in a number of instances to regain motion in the joint amounting to from 15 to 65 degrees of the normal range. To assure himself on these points in the surgical technique, Dr. Weir said, he had recently put himself into communication with C. H. Mayo, and had learned from him that his inferences were correct. Dr. Mayo had informed him that the crucial ligaments were not divided; that he only divided the capsule and the patellar ligament over the anterior half of the joint, and that the patella was not sutured.

If such authorities as these. Dr. Weir said, could get such good results and such a desirable degree of motion with a minimum amount of surgical damage, was it not possible that some of Mayo's willing followers had out-Heroded Herod and violated Talleyrand's injunction of showing too much zeal in dealing with these cases.

In concluding his remarks, Dr Weir said it seemed to him that the following deductions were justifiable

(1) That as the simpler, large double lateral openings of the joint (*1c*, running up to the top level of the capsule) would suffice for packing and drainage in the majority of cases, that method should be the one first tried in dealing with a suppurative arthritis

(2) That if more radical efforts were required, the Mayo method should be resorted to *1c*, transverse section of the anterior half of the joint, with irrigation and packing, together with flexion (not to an extreme point) of the limb on a splint, conjoined, in special cases, with popliteal drainage

(3) In rebellious or progressively septic cases, endangering life, a wide open (utterly destroyed) joint, with uplifted patellar flap and extreme flexion, should be resorted to Here the crucial and lateral ligaments should be divided

In the first and second instances, there would be some hope of a more or less useful joint In the last, only resection or amputation could be the outcome, if life was saved Furthermore, in opening an acutely suppurating joint it is suggested that the flap method be reversed and the incision starting from a point a little below the articular line and in front of the lateral ligament should run across the joint at the top level of the capsule and terminate at a corresponding point on the other side of the articulation This flap would open up best the area hardest to drain and if necessary, beside the irrigation and packing that follows the incision, it can be deflected with more ease than the one of Mayo and, better still, be more readily replaced by reason of its thinner base It would permit likewise the coincident or subsequent division of the ligaments if this should be desired

DR GEORGE E BREWER said he had had four cases of septic infection of the knee joint, three of which were referred to by Dr Peck In at least one of those cases there was a very severe grade of infection, and he did what had been spoken of as the typical Mayo operation He removed the crucial ligaments, but did not turn back the flap The patient improved somewhat, but in spite of posterior drainage the suppuration persisted much longer than in those cases where he opened the joint more widely Dr Brewer said that if this case had been operated on earlier, the measures that were resorted to might have sufficed

In a case which he showed at a meeting of this Society two or three years ago, the patient, while drunk, had fallen against a rock, and sustained a ragged, contused wound involving the knee joint. Simple drainage was tried for a day or two, but the infective process was so virulent and extended so rapidly that a radical operation was done. After four or five weeks the suppurative process came to an end without the formation of any secondary abscesses. A resection was then done, and after bringing the two cut surfaces into apposition, the skin was united loosely over the wound and a wet dressing applied. The wound healed by granulation and further recovery was uneventful.

DR. V. P. GIBNEY said he recalled one case of acute infection, secondary to tuberculosis of the knee joint, where he opened the joint by a transverse incision. In spite of this the suppurative process persisted, and amputation became necessary as a life-saving measure. The Mayo operation, the speaker said, had not appealed to him in the class of cases that came under his observation. He rarely saw cases of acute suppurative arthritis in adults or adolescents. He occasionally met with the condition in infants, and in those cases he usually found that prompt incision, freely opening the joint, gave very satisfactory results, sometimes with resoration of function.

DR. ROYAL WHITMAN asked Dr. Peck if he had had any experience in the treatment of secondary infection of tuberculous knee joints by this method? The speaker said he had found those cases very difficult to drain. The tissues of the joint, as a rule, were thickened and spongy, and while the immediate results of this radical operation were usually good, the exuberant granulations soon filled the wound and destroyed the exposed area. These became infiltrated with pus, so that drainage might be worse than before.

DR. GEORGE D. STEWART said he recalled several cases in which he had operated on the knee joint somewhat after the manner described by Dr. Peck. The first case, which he saw several years ago, was one of severe infection of the joint in a child. It was operated on by the so-called Mayo method, but the result was not very satisfactory, and a resection was ultimately necessary.

The second case was that of a penetrating wound of the knee joint in an adult. Suppuration occurred, and after pro-

longed drainage had proved unsatisfactory, the joint was widely opened, the crucial and lateral ligaments divided, leaving nothing but the ligament of Winslow. The wound was irrigated and packed, and subsequently the joint was resected and the skin sutured loosely, after the manner described by Dr Brewer. The patient made a good recovery, with a useful limb.

In speaking of popliteal drainage of the knee joint, Dr Stewart said that he had never found it effective, so far as his experience went, even in the milder forms of infection. The muscles always drew the bones backward, and shut off drainage. In such cases, by flexing the knee slightly, access could be secured to the posterior pockets by going under either lateral ligament. A tube introduced in this way would not be compressed by the bone and would drain fairly well. Ideal drainage of this joint he did not believe possible.

The third case was one which Dr Stewart, just before leaving on his vacation, turned over to a colleague for operation. The joint was widely opened and packed and when Dr Stewart next saw the patient, about six weeks later granulations had sprung up everywhere except over the articular cartilages, these, remaining, made it impossible to straighten the limb and delayed the progress of the case. Because of this and the increasing posterior displacement it was necessary to excise the joint practically after the method described by Dr Peck, the result was prompt and satisfactory. Because of the delay occasioned by the articular cartilages, Dr Stewart believes it best in any of these operations to remove the cartilages after the acute infection has subsided.

DR WOOLSEY said that after seeing a case of this kind which was shown by Dr Gerster some ten years ago, he had been induced to resort to the procedure in two or three instances. One of them was particularly interesting, as the infection of the knee joint followed a fracture of the patella which had been sutured subcutaneously. Coincident with the infection, there was necrosis of the patella. Lateral openings were first made, but as these proved insufficient, a joint flap was made and turned back. The crucial ligaments were not divided. The result was fairly satisfactory.

DR PECK, in closing, said he had never applied this method to tubercular joints, nor had he seen it applied in such cases. He

was inclined to agree with Dr. Whitman that in dealing with tubercular infections of the joint, the method would not possess the value that it had in suppurative cases.

In regard to the method in general, Dr. Peck thought that the cases of knee-joint infection could be divided into three classes: First, that large proportion of cases which could be controlled by lateral incision and drainage. According to the figures given by Flint, from 70 to 80 per cent. recovered by that method with a fair amount of motion. Second, the typical procedure of Mayo was indicated in a certain proportion of cases, more particularly, it seemed to the speaker, in children, in whom the reparative processes were comparatively active. Third, in cases similar to his own, or to those reported by Drs. Brewer and Stewart, where the process was destructive or the infection was of a very virulent type, the proper operation was the complete one, with division of the crucial ligaments and eversion of the flap, thus completely exposing the posterior recesses of the joint. The latter were capable of containing a great deal of pus and of seriously interfering with complete drainage unless the crucial ligaments were divided. Popliteal drainage might answer the purpose in some cases, while in others lateral drains inserted under the lateral ligaments might prove satisfactory without division of the crucial ligaments, but in most of the severe cases the complete operation was demanded, and it should only be done as a preliminary to resection.

TRANSACTIONS

OF THE

PHILADELPHIA ACADEMY OF SURGERY.

Stated Meeting held December 3, 1906

The Vice-President, DR ROBERT G LECONTE, in the Chair

SUBPHRENIC ABSCESS FOLLOWING APPENDICITIS

DR JOHN H JOPSON presented a man who had walked into the Presbyterian Hospital, three months previously, suffering from acute appendicitis. Operation was performed at once and revealed a generalized peritoneal inflammation with much free pus and a perforated and gangrenous appendix. The appendix was removed and the abdominal cavity freely drained, the patient treated by a modified Murphy treatment,—that is, frequent rectal injections of salt solution and the exaggerated Fowler position. The condition of the man after the first day or two caused no anxiety until several days later when a persistence of temperature of 100° to 102°, without apparent cause, attracted attention. The wound was explored, without revealing a pocket of pus and there was no pelvic collection. Finally, dulness could be demonstrated posteriorly over the lower portion of the right chest, but all other signs typical of a subphrenic collection were lacking. There appeared no other cause for the symptoms, but the man was not physically depressed, and Dr Jopson was loath to believe that subphrenic abscess was present. At the end of two weeks the chest was tapped without obtaining any fluid. The fever continued and after persisting for four weeks it was decided that there must be a subphrenic abscess. Dr W E Hughes, who also saw the patient at this time, gave as his opinion that there was pus somewhere between the upper surface of the liver and the lower portion of the lung. Before operation could be performed

the patient expectorated a large quantity of foul pus, the temperature rose to 104° , respiration and pulse became more rapid and the patient showed evidences of shock and sepsis. There evidently had been rupture into the lung. Dr. Jopson thought the pus had first gone into the general pleural cavity. He decided on account of the shocked condition of the patient to wait 24 hours before operating, but again aspirated, this time in the tenth interspace posteriorly, and obtained several ounces of fetid pus. He intended operating the next day but the patient suddenly became worse, with dyspnoea and very rapid pulse, there evidently being an acute effusion in the right pleura. Operation was performed the same day under local infiltration anaesthesia, an intercostal incision being made posteriorly between the tenth and eleventh ribs. A pint of cloudy serum was evacuated from the pleura and the opening made in the diaphragm by the needle observed. This was dilated by the finger, and the subphrenic collection drained. Rubber drainage was inserted into both the pleura and the abscess cavity. The drainage furnished by this incision was not considered satisfactory but the patient's condition was bad and it was made to suffice. The man did well after the operation and now only a small sinus remains. The pleura has closed and there is resonance down to the site of incision.

Appendicitis, the etiological factor here, is probably the commonest cause of subphrenic abscess, and this is especially true in children, as Dr. Jopson had emphasized in an analysis of 23 cases of subphrenic abscess in children which he had made several years ago. The diagnosis was obscured by the absence of constitutional symptoms except fever, and the indefinite nature of the physical signs. The pleura was infected at the time of the second operation, possibly by leakage from the point of aspiration, and it was not necessary to protect it by suture or packing, and this rendered drainage of the abscess feasible by local anaesthesia. The experiments of Noetzel apparently show that the pleura is more resistant to infection than muscle or skin, but this resistance is broken in the presence of a pneumothorax. Clinically, the pleura seems to be very susceptible of infection.

DR. WILLIAM L. RODMAN said Dr. Jopson was correct in saying that the majority of subphrenic abscesses are found in connection with suppurating appendicitis. Formerly it was regarded as most frequently caused by perforating gastric ulcer,

but Korte in his masterly review of the subject, showed that the vast majority were due to suppurative lesions of the appendix. He prefers to employ the transpleural route in evacuating the abscesses, and undoubtedly that was the better method in Dr Jopson's case.

CAVERNOUS ANGIOMA OF THE UPPER EXTREMITY

DR. ASTLEY P. C. ASHHURST presented a girl, twelve years of age whose right arm was the seat of a diffuse cavernous angioma. For his description of the case and remarks upon the condition see paper on page 419.

DR. RICHARD H. HARTE said that in a worse case than that shown by Dr. Ashhurst he had used hot water injections after the method of Wyeth but this produced no effect. He thought at first there was some improvement but the final result was no gain.

DR. WILLIAM L. RODMAN has used hot water injections in four or five well marked cases of cavernous angioma with improvement in one or two but no cure. He considers the procedure dangerous as embolism may result and it does not promise satisfactory effects. His preference is for excision. If one keep well out in the healthy tissue there is no more trouble than in removing a solid tumor.

FRACTURE OF THE CORACOID PROCESS OF THE SCAPULA CAUSED BY MUSCULAR ACTION

DR. ORLANDO H. PETTY presented a man who had sustained a fracture of the coracoid process of the scapula from muscular action. For the description of the case and remarks upon the condition, see page 427.

DR. GWILYM G. DAVIS said there is evidence to show that almost any bone in the body may be broken by direct violence and so may the coracoid process. Dr. Allis has produced this fracture by manipulation of the humerus, the break may possibly be caused by tension of the muscles inserted into the process the coracobrachialis and short head of the biceps. The injury is probably often overlooked in dislocation of the humerus on account of the greater injury to the joint. The progress of the head of the humerus upward is stopped by the coracoid process hence one would expect to find fractures of the process in these cases of dislocation.

DR. ADDINELL HEWSON was inclined to disagree with some of the statements made by Dr. Davis. The capsule of the shoulder joint is thickened at the base of the coracoid process by the coracohumeral ligament and above this is the coraco-acromial, a stout ligament connecting the coracoid and acromion processes. In forcible pushing upward of the head of the humerus, the head strikes the coracohumeral ligament and is thus prevented from striking the coracoid process. The weakest point in the capsule is below the coracohumeral ligament. With the patient holding on the bar by one hand and with the other pulling on a man, action on the coracoid process would be exerted by the coracobrachialis, the short head of the biceps and the pectoralis minor. The conoid and trapezoid ligaments fix the body of the process, leaving the side and top to be acted on by the muscles. The ligaments have no effect in staying the action of the muscles. If the humerus be placed at right angles to the body and force is applied from behind, the humerus would be forced against the coracoid, and the short head of the biceps and the coracobrachialis would snap off the tip of the process.

REPORT OF THE SURGICAL CLINICS FOR STUDENTS AT THE GERMAN HOSPITAL, 1905-1906.

DR. JOHN B. DEEVER presented this report, for which see page 431.

PERFORATION OF THE BOWEL IN TYPHOID FEVER.

DR. CHARLES F. MITCHELL reported eight cases of typhoid fever operated upon for perforation. He referred to the recent articles by Drs. Harte and Ashhurst on "Intestinal Perforation in Typhoid Fever" (*ANNALS OF SURGERY*, vol. xxxix, page 8), and the monograph by Dr. J. A. Scott, entitled "A Study of Fifty Cases of Perforation in Typhoid Fever" (*University of Pennsylvania Medical Bulletin*, May and June, 1905), which treated every phase of this subject in minute detail.

Seven of the eight cases occurred at the Pennsylvania Hospital; and he was indebted to the surgeons of that institution for the privilege of operating upon and reporting them. The other case was operated upon at the Germantown Hospital.

Three of the cases are mentioned in the article by Drs. Harte and Ashhurst and five were reported by Dr. Scott.

The history of the various cases was as follows

CASE I—R P, aged 28 years, colored, hospital No 2454, admitted October 31, 1902 Perforation, operation, and death on November 6 Had chancre within two years, used alcohol freely, and had malaria several times Admitted to medical ward after seven days illness characterized by headache, diarrhœa, and daily chills for five days The urine showed hyalogramular casts, and the spleen was palpable Had moderately severe attack On October 3, at 3 A M, he was aroused from sleep by sudden abdominal pain (tenth day of disease) situated in both lower zones This was the first abdominal pain complained of since his illness began He vomited his milk, pulse became more rapid, the belly was not rigid, but generally tender By 5 30 A M he vomited greenish mucus There was moderate tympanites present, most marked in lower zones Rigidity was now distinct, especially on the right side, slight tympanites Doubtful movable dulness in the flanks Breath sounds heard distinctly over abdomen as low as umbilicus Liver dulness was absent in mid clavicular line, present in axillary line Leukocytes at 6 15 A M, 11,360 Operation at 7 30 A M Perforation in ileum six inches above ileocæcal valve the size of a slate pencil Death from general peritonitis Autopsy

CASE II—A A, aged 28 years, white, hospital number 138, admitted April 4, 1903, discharged June 25, 1903 Had malaria ten years ago, denies venereal disease Began to feel badly three weeks ago, worked until two days before admission Had chills headache, cough no epistaxis, no diarrhœa The abdomen was soft and not tender, temperature about 103 1° The day after admission he complained of abdominal pain, abdomen was rigid and tympanitic, but relief was obtained by the rectal tube On April 8 he had two bloody stools and after a week the fever began to remit, while the abdomen became painless and soft On April 10 there was evidence of rough breathing at both bases, with fine rales and he complained of sharp pain over the left base on deep inspiration or cough One week later the temperature touched normal, though he still complained now and then of chest pain On April 19 (the thirty-sixth day) the temperature rose suddenly, and he had severe pain over the costal region, where an occasional friction rub could be heard The following morning the expression was anxious, the abdomen was very rigid but not

tender. There was no vomiting and the temperature was not altered. Diagnosed perforation, and operation done at noon. No perforation or peritonitis found and no pain was experienced after operation for four or five days. Distinct symptoms of consolidation of the left base subsequently appeared. The patient made a good recovery.

CASE III.—A. G., aged twenty-one years; hospital number 1602. Admitted August 25, 1903. Perforation, operation and recovery. Discharged November 2. Entered the medical ward on the tenth day of typhoid. The temperature was high at the start, but was soon controlled by baths. The abdomen was soft and not tender; spleen readily palpable and tender; active bronchitis. At 6.30 P.M. on August 31 (sixteenth day) he complained of sharp pain on the right side of the abdomen, which was very tender; the recti were somewhat rigid; he had neither chill or vomiting. By 9 P.M. all the symptoms had increased in severity; leukocytes were 9,600. Perforation diagnosed; operation; perforation in ilium found. This patient made a good surgical convalescence; the temperature fell and remained down for seven days after operation. On the thirty-third day the temperature again rose and the patient suffered a true relapse.

CASE IV.—F. P., aged eighteen years; admitted November 9, 1903. Perforation, operation and recovery. Admitted with a history of a mild typhoid of thirteen days' duration. At 12 noon on the fifteenth day of his disease he had sudden severe abdominal pain, tenderness on the right side, spasm of the right rectus, costal respiration, and complete obliteration of liver dulness. At 3.30 P.M. the leukocytes had arisen to 17,600; at 5 P.M. they were 16,500, and at 7 P.M. 13,400. The temperature, which was 100° at the time of the first pain, fell to 99.2 at 1.30 P.M., remained the same at 2.30 P.M. and by 3.30 P.M. had arisen to 103.3°. The operation was performed eight hours after perforation and showed free gas in the peritoneum, the presence of fluid, and a perforation in the ilium. This was a so-called typical case of perforation in which all the symptoms were present and the blood findings conclusive. This patient recovered.

CASE V.—H. C., aged twenty-eight years; admitted October 12, 1904. Typhoid perforation, operation, recovery. Discharged January 4, 1905. Entered ward on eighth day of typhoid, the onset of which was marked by fainting attacks and daily

chills until the day of admission. He had some abdominal pain, the belly was normal, the spleen palpable. On the day of admission he had a chill followed by high temperature. No malarial parasites were discovered after a careful search. The temperature range was high, though he responded readily to tubbing, but had frequent chills after being in the water. The baths were stopped on October 16 and sponges substituted, from which time he had no chills. On October 15, the eleventh day, he complained a great deal of abdominal pain. Nothing, however, developed. On October 25, the twenty-first day, he had a small hæmorrhage which did not seem to affect his general condition. He was delirious at times and very stupid. On October 30, the twenty-sixth day, at 5 30 P M., he cried out with pain in the right side below the level of the umbilicus but radiating through the abdomen. No rigidity was present and a hot water-bag gave relief. Two hours later there was a slight rigidity of both recti, especially the right. He vomited greenish fluid. The pain continued at intervals and his condition remained the same until between 2 and 3 A M. The leukocytes at this time were 5,900. At 3 A M. he had another paroxysm of pain, the abdomen was slightly distended and tender, the liver dulness gone, the flanks clear. There was abdominal breathing, but the right rectus was distinctly more rigid than the left. Operation at 3 30 A M. Cloudy fluid in abdominal cavity, perforation the size of a lead-pencil eighteen inches above the cæcum, in the centre of an ulcer the size of a five-cent piece found. The patient reacted well and continued to do well until the eighteenth day after operation when a fæcal fistula developed. This finally closed and he was discharged on January 4, 1905.

CASE VI—G A., aged twenty six. Admitted August 22, 1906. Operation. Death August 30, 1906. Illness began about one week before admission, with headache, nose bleed, anorexia and general malaise. The bowels were normal. On admission tongue was slightly coated, tip red, spleen enlarged, rose-colored spots, and iliac tenderness. Widal reaction positive, leukocytes count 8,070. Five days after admission had hæmorrhage of eight ounces, temperature falling to normal six hours after expelling hæmorrhage. The following day, at midnight, after taking his medicine, he vomited several times, broke out into a cold sweat, and complained of pain in right iliac region. The abdomen was

tender but there was no distention. Leukocyte count 9,870. On the following morning, August 29, at 8 A.M. the belly was very tender; had cough and vomited several times. Was tender over the whole abdomen but it was more marked over the right side. The temperature at this time was 102° , pulse 128 and thready in character. Operation was done at 12 noon, abdomen opened in right semilunar line and a perforation found the size of a pin-head in the ilium eight inches above the ilio-cæcal junction. This was closed with linen thread and abdominal cavity flushed out with normal salt solution. Gauze drains were used. The patient did fairly well for twelve hours but suddenly collapsed and died the following day, thirty hours after operation.

CASE VII.—F. M., aged twenty-eight years, admitted October 21, 1906. Perforation; operation. Died October 23. Unable to obtain full history, as patient did not speak English. Sent in with diagnosis of appendicitis; had not been feeling well for two weeks previous to admission but had not been confined to bed. Brought to hospital by ambulance at 11.35 A.M. with only the history of a sudden severe attack of abdominal pain the previous evening. On admission the temperature was 103° , the abdomen extremely rigid and tender all over, liver dulness present. The general appearance of the patient and the history of not feeling well for two weeks suggested the diagnosis of perforated typhoid ulcer instead of appendicitis. Operation was done within two hours after admission and pin-point perforation in ilium about four inches above ilio-cæcal valve found. Opening closed with silk sutures, peritoneal cavity not flushed with salt solution but merely drained with strips of gauze. Patient did fairly well for fifteen hours when a change for the worse set in and he died about thirty-six hours after operation.

CASE VIII.—J. C., twenty-eight years of age. Admitted November 17, 1906. Perforation, operation, death November 27. Family and previous history negative. Eight days before admission was seized with severe headache, complained also of feeling tired but did not go to bed until three days later. Had several attacks of vomiting, nose-bleed, cough; no diarrhœa. On admission temperature was 103.3° , patient seemed very dull, physical examination of chest negative, spleen enlarged but not palpable, abdomen distended but not rigid or tender. Urine examination showed the presence of a small amount of albumin and a con-

siderable number of dark and pale granular and hyaline casts. Condition remained about the same until the morning of the twenty-first when, about 11 A.M., he complained of abdominal pain, there was a little more distention, and slight rigidity of the right rectus was noted. Bladder seemed distended, catheter was passed and seventeen ounces of urine were drawn off. This seemed to relieve the pain somewhat. Leukocytes 6,450. At 2 P.M. leukocytes were 3,800, temperature 102.2°, pulse 102, breath sounds could be distinctly heard over the abdomen which was exquisitely tender, and there was considerable rigidity of the right rectus. Liver dulness was practically obliterated. At 7 P.M. temperature was 103.1°, pulse 106, respirations 42, tongue and lips dry, had not vomited but had been belching a great deal. The abdomen was greatly distended, liver dulness entirely gone, dulness in flanks, the whole abdomen was extremely tender and both sides were equally rigid. Operation. Abdomen opened in right semilunar line, immediately upon which there escaped a considerable quantity of cloudy fluid which was found to entirely fill pelvis. A perforation the size of a pin head was found in the ilium about four inches from the cæcum. This was closed with linen thread and the whole abdominal cavity flushed with salt solution. Drains of gauze were introduced. The patient did well for five days following operation, the temperature remaining about 99, and the pulse being fairly strong. On the beginning of the sixth day after the removal of some of the drains he complained of pain in the abdomen, the temperature became elevated and he gradually grew worse, dying on the morning of the seventh day. Autopsy showed that the stitches closing the perforation had failed to hold, the presence in the pelvis of considerable pus, also a double lobar pneumonia.

Resume—All the cases operated upon were males, their ages ranged from eighteen to twenty-eight years, five of the eight cases being twenty-eight years old. In one case operated upon no perforation was found. This case recovered. Of the remaining seven cases, four died and three recovered, a mortality of 57.1 per cent. The first symptom of perforation appeared in three of the cases on the fifteenth day, and in the other five cases on the tenth, twelfth, twenty-first, twenty-sixth, and thirty-sixth day respectively. Hæmorrhage from the bowel preceded perforation in three of the cases, being very slight in two, while in the third it

amounted only to eight fluid ounces. One of the cases that recovered had a slight hæmorrhage.

The time between perforation and operation had been reckoned from the first onset of pain; in the cases that recovered it being 4½, 8 and 10 hours, while in the four that died it was 3, 8, 12 and 15 hours.

The leukocytes were counted in all but one case, and all showed a leukocytosis except in one of the three that recovered, which had a count immediately before operation of 5,900. In the case which had the highest count there were 17,500 leukocytes three hours after the first symptom, two hours later 16,500 and two hours still later or seven hours after perforation had taken place there was a count of 13,400. In the last case, operated on November 21, 1906, at the time of the first sign of trouble the count was 6,450, three hours later it was 3,800, and just previous to operation, or eight hours after the first symptom of perforation, there were 9,000 leukocytes.

None of the cases had more than one perforation; four were pin-head size, one the size of a lead-pencil and one that of a slate pencil. In one case the size of the perforation is not mentioned in the history.

It is interesting to note that the case which had the largest perforation was one of the three that recovered. The last eighteen inches of the ilium was the seat of the seven perforations.

The various operations were done under ether anæsthesia, incision made either through the outer border of the right rectus or through the right semilunar line. Fine silk was used to close the perforations except in two instances when linen thread was used. The abdominal cavity was flushed with salt solution in two of the cases, both of which died. Gauze drainage was used in every case and the wounds left entirely open to permit free drainage.

DR. RICHARD H. HARTE said that the figures presented by Dr. Mitchell were very materially below the general mortality in typhoid perforation. Through Dr. Mitchell's large experience at the Pennsylvania Hospital he has acquired ability of high order in the diagnosis of perforation. An important point of technic following operation has been emphasized by Dr. Mitchell. It is the custom of some surgeons after closing the perforation to flush the abdominal cavity with salt solution. This Dr. Harte

believes to be bad surgery as it disseminates septic material. In cases with a small perforation and in which operation is performed reasonably early, irrigation is a mistake it being applicable only in cases in which extensive soiling of the peritoneum has taken place and where dry sponging would be out of the question. Instead the cavity should be wiped out and packed with large quantities of gauze, this being placed between the coils of intestine. Many deaths are due to perforation in typhoid fever and the surgical side should be presented more emphatically to medical men that more cases may be recognized early and saved. In connection with one of Dr Mitchell's cases Dr Harte mentioned a personal case in which the patient died six weeks after perforation.

DR JOHN B. DEEVER agreed with Dr Harte regarding irrigation in infections of the peritoneum. In these cases the best rule is to get in quickly and get out quickly doing as little as possible. The consensus of opinion now is that irrigation is not so good as was formerly supposed. Dr Deever believes that perforation and hæmorrhage in typhoid have as one of the causes cold bathing. When the patient walks to the tub his resistance is taxed, later, while in the water he is chilled and it is reasonable to believe that hæmorrhage is thus induced. It is a good thing for country patients that tubs are not available. Dr Muhlenberg of Reading formerly used the Bland method heroically and had many cases of hæmorrhage. Now he employs a let alone policy and sees but little hæmorrhage. If this be true why would there not be fewer perforations if too strenuous bathing was not employed?

DR W. JOSEPH HEARN said that he does not wash out the peritoneal cavity at all in cases of peritonitis, but simply sponges. In but few cases is peritonitis general and these patients die. The same rule applies here as in burns. If all the skin is destroyed the person dies, if only part is burned he may get well. So in cases of general peritonitis the subjects die. Dr Hearn has recently operated on four cases of perforative appendicitis the perforation being near the junction of the appendix with the cæcum. In all, the abdominal cavity was simply sponged out, and he is sure that three of the patients will get well and entertains hope regarding the fourth.

DR WILLIAM L. RODMAN said that Dr Mitchell's results

were better than the average and show the value of early diagnosis and prompt operation. In the main, Dr. Rodman is in accord with what had been said about irrigation. If gross soiling of the peritoneum be present he irrigates, as in the case of gunshot wounds of the intestine. As a rule in these cases, if operation is performed before intestinal paresis and soiling of the peritoneum have occurred, irrigation is not employed. Where visible soiling is present and fæces have passed out of the intestine, irrigation is perhaps best. It is remarkable how often one finds in these cases that no soiling has occurred. Murphy in 1890 demonstrated that soiling does not take place until the intestine is handled, and this observation stands good to-day. In one case of twenty-one perforations of the intestine by a rifle ball no extravasation had occurred, though two of the perforations were large. Operation was performed an hour after the injury. In another case a great amount of extravasation was present, this including an apple core which had passed into the peritoneum. As a rule, then, there is not much extravasation if cases of perforation are operated upon promptly; if there be gross soiling of the peritoneum, irrigation is demanded.

DR. GWILYM G. DAVIS has during the past year operated on eight patients with perforation and one in which the physician desired operation and no perforation was found. Six of the eight perforative cases died, though some lived quite a while after operation. Others were in extremely bad condition and lived but a short time. The non-perforative case also recovered. As to the mode of operation the transverse incision is employed and the operation begun under local anæsthesia. If perforation is found a general anæsthetic is then given. As to drainage and sponging, if the intestine is pulled out and soiling ceases, sponging is regarded as sufficient. If soiling be extensive, sponging requires too much time and causes too much shock. When fæces are spread all over the abdominal cavity, irrigation is employed. The operation requires from nine to twenty-five minutes. One must be governed by the condition of the patient. In some cases the work may be done with exactness, in others one must hurry. When perforation is not found, general anæsthesia is not necessary and the operation does not prejudice recovery. One of these patients had a second perforation some time after the first, for which an operation was done on the opposite side.

He recovered. Counting this as an additional case makes 9 cases with 3 recoveries besides the recovery from the exploratory procedure.

DR MITCHELL, in closing, said that if he had employed local anæsthesia in one case he would not have found the perforation. When the abdomen was opened it was clear and no exudate was present, protracted search was necessary to locate the opening. In answer to a question of Dr Rodman, Dr Mitchell said that ten hours was the longest time between perforation and operation in the cases that ended in recovery.

CORRECTION.—In the Transactions of the Philadelphia Academy of Surgery, meeting of November 5, published in the February issue, on page 317, line 17, for the word "found" substitute "round," so that it will read "ureteral calculi are rarely round."

BOOK REVIEWS.

TUMORS, INNOCENT AND MALIGNANT. By J. BLAND-SUTTON, F.R.C.S., Surgeon to and Member of the Cancer Investigation Committee of the Middlesex Hospital, etc. Fourth edition. Chicago: W. T. Keener & Co., 1907.

The fourth edition of this work is in many ways an improvement upon the third edition, which appeared in 1903 and was reviewed at length in the *ANNALS OF SURGERY*. The author has changed his classification of tumors and from the four original groups has extended the number to six, as follows: I. Tumor-Diseases of the Connective Tissues; II. Tumor-Diseases of Teeth; III. Epithelial Tumors; IV. Tumors arising from the Foetal Membranes; V. Teratomata; VI. Cysts. In distinguishing between innocent and malignant tumors he defines them thus: "The baneful effects of innocent tumors depend entirely on the environment, but malignant tumors destroy life whatever their situation."

A most interesting chapter has been introduced concerning the cause of cancer. In this subject the author is especially well qualified to speak with authority, and he presents the three theories, the Embryonic, the Parasitic, and the Biologic theory impartially. His conclusion is that nothing is known as to the cause of cancer.

The chapter dealing with tumors of the ovary and testicle have been much improved. Two essays have been devoted to their consideration.

PAUL PILCHER.

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UROTROPIN AND HELMITOL.

Guiard (*Annales des maladies des organes genito-urinaires*, October 1, 1905) considers that the efficacy of helmitol is exclusively due to the urotropin which enters into its composition. It has also the same clinical indications, since it is always the urotropin which is its chief active principle. As helmitol is associated with an acid sometimes injurious and of doubtful value, it is better to employ the less complicated drug, urotropin. Again, urotropin will be found to be cheaper than helmitol. Urotropin is the preferable drug from the standpoint of efficacy, innocuity and economy.

Urotropin must, however, be absolutely perfect. Many of the preparations on the market are of doubtful value, or are positively injurious.—*American Journal of the Medical Sciences*, May, 1906.

Dr. William J. Robinson writes in the *Critic and Guide*, March, 1906, in a paper on "Proprietary Remedies from the Physician's Standpoint":

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pleuritic pains of advancing pneumonia and in the arthralgias of acute rheumatism. They have been found to allay the lightning, lancinating pains of locomotor ataxia; but nowhere may they be employed with such confidence as in the neuralgias limited to the area of distribution of the fifth nerve. Here their action is almost specific, surpassing even the effect of aconite over this nerve.

WHERE HUMOR, LOVE, AND MYSTERY PREVAIL.

March Lippincott's Magazine breathes a foretaste of summer in its leading feature, the complete novelette. "The Smuggler" is its title, and the author, Ella Middleton Tybout, has already to her credit several successful full-grown novels, notably "The Wife of the Secretary of State." This newest story does not deal with smugglers and pirates of the past, but with the modern manner of getting jewels into our fair land without asking Uncle Sam's consent. The characters are mightily convincing in their various roles; and her rapid-acting plot makes the most indifferent reader "sit up" until he has devoured the last word.

Ellis Parker Butler has never written anything funnier than "Pat Cronin and the Foretellin' Lady." It beats the record of "Pigs is Pigs." A more serious story, of subtlety and originality, is "The Convict Strain," by Edith Robinson. An amusing episode in the domestic life of the newly married is "The Accomplished Mrs. Thompson," by Norval Richardson. Another one of Marion Hill's inimitable humorous sketches of neighborhood types is "The Too-Travelled Kings." Will Levington Comfort's name is associated with the best kinds of Western stories, and his contribution this month, "The Fighting Death," is powerful and clear. "Miss Merriam's Groom," by Harold R. Durant, is a pleasing tale of love and disguise. "The White Passion of the Sea," by a new writer, Nina Spalding Stevens, is a vignette of the sea, which is intensely human and shows promise for its author.

"The American Gentleman," by Minna Thomas Antrim, evidences keen observation; and under an entertaining style in presenting comparisons, there is earnest endeavor to define this rather difficult line. Incidentally, the author demonstrates the difference between a "gent" and the genuine article.

Among the poets appearing this month are Florence Earle Coates, whose verses called "The Lark" are especially attuned to the Easter season, Mary Byerley, Charles Hamilton Musgrove, Fullerton L. Waldo, Grace MacGowan Cooke, and Mary Caldwell Richardson.

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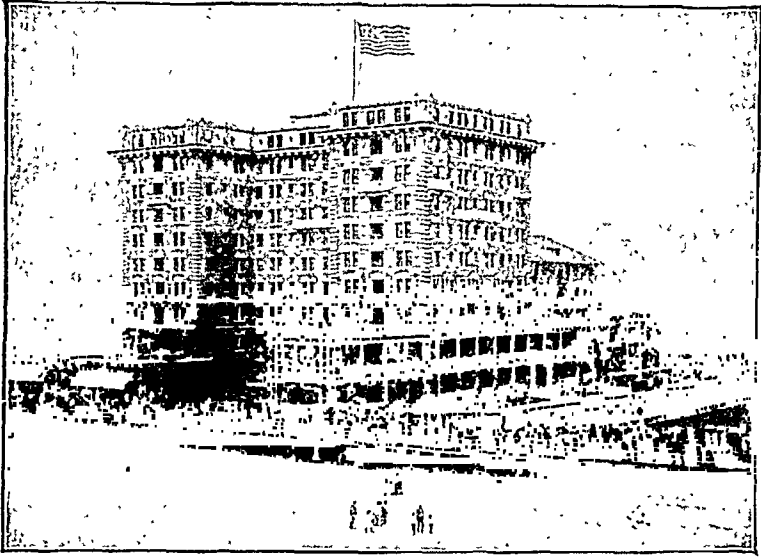
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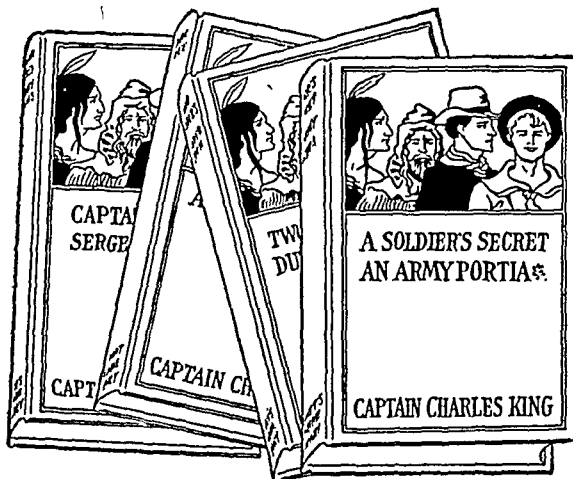
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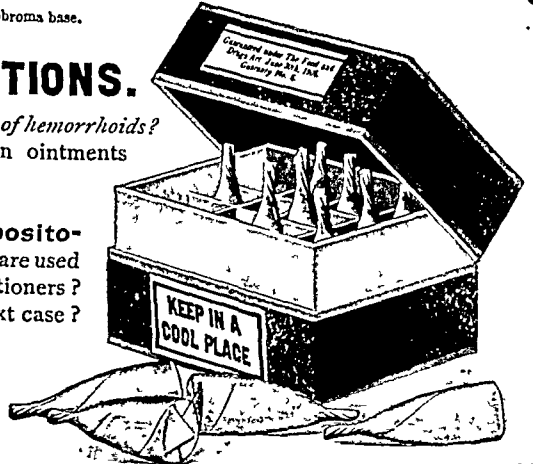
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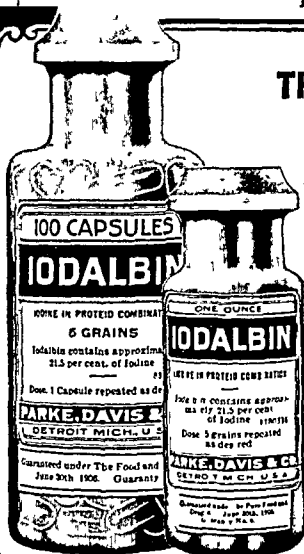
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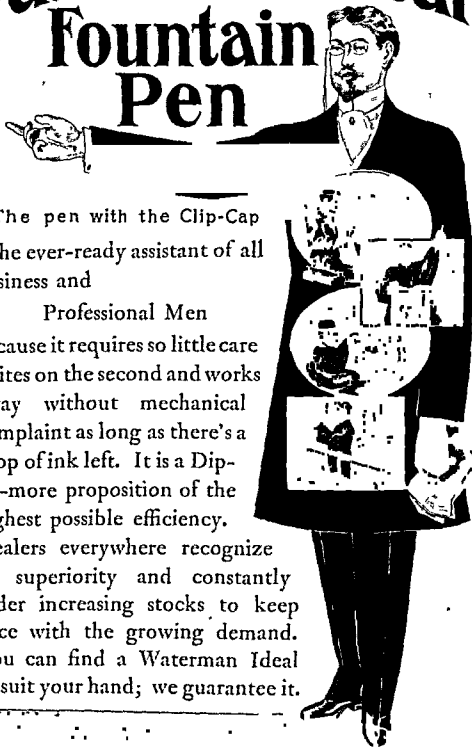


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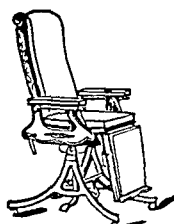
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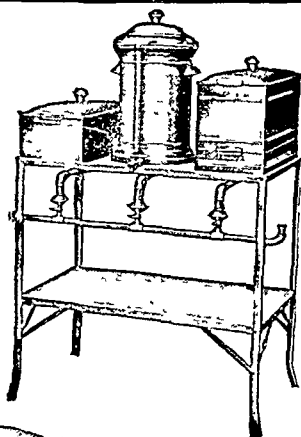
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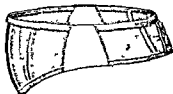
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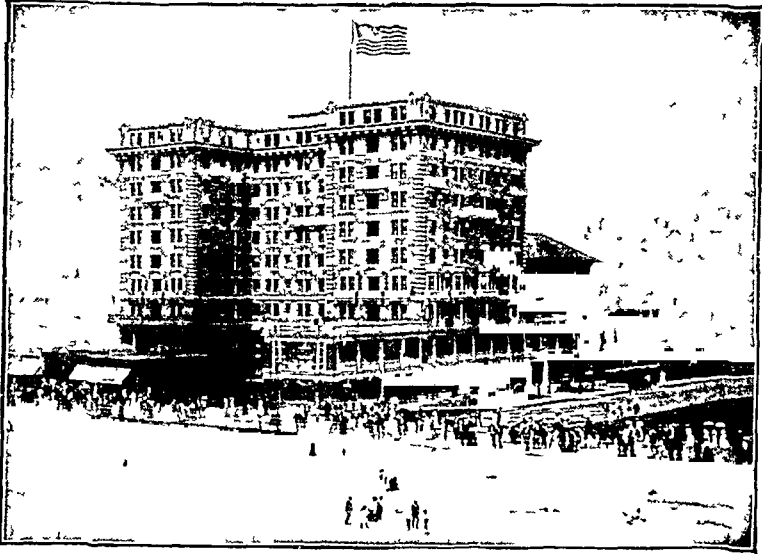
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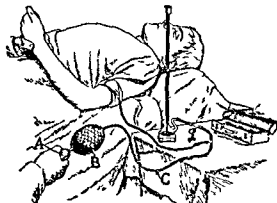
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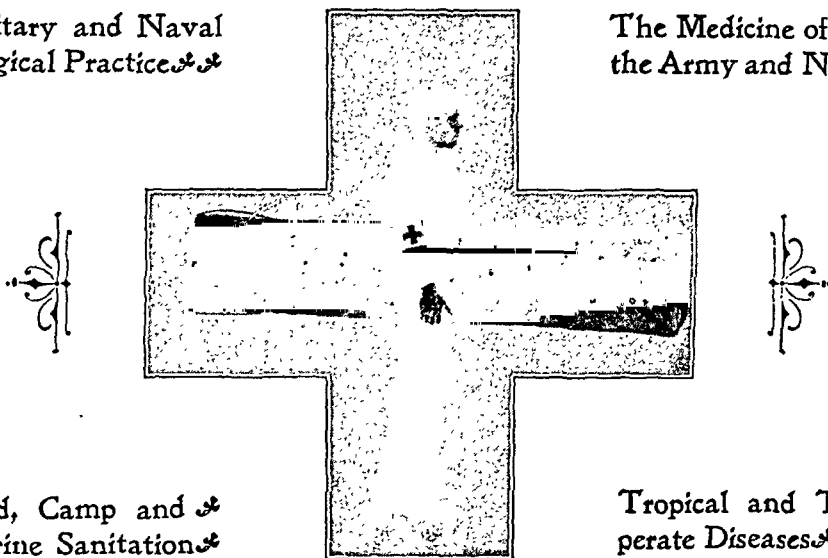
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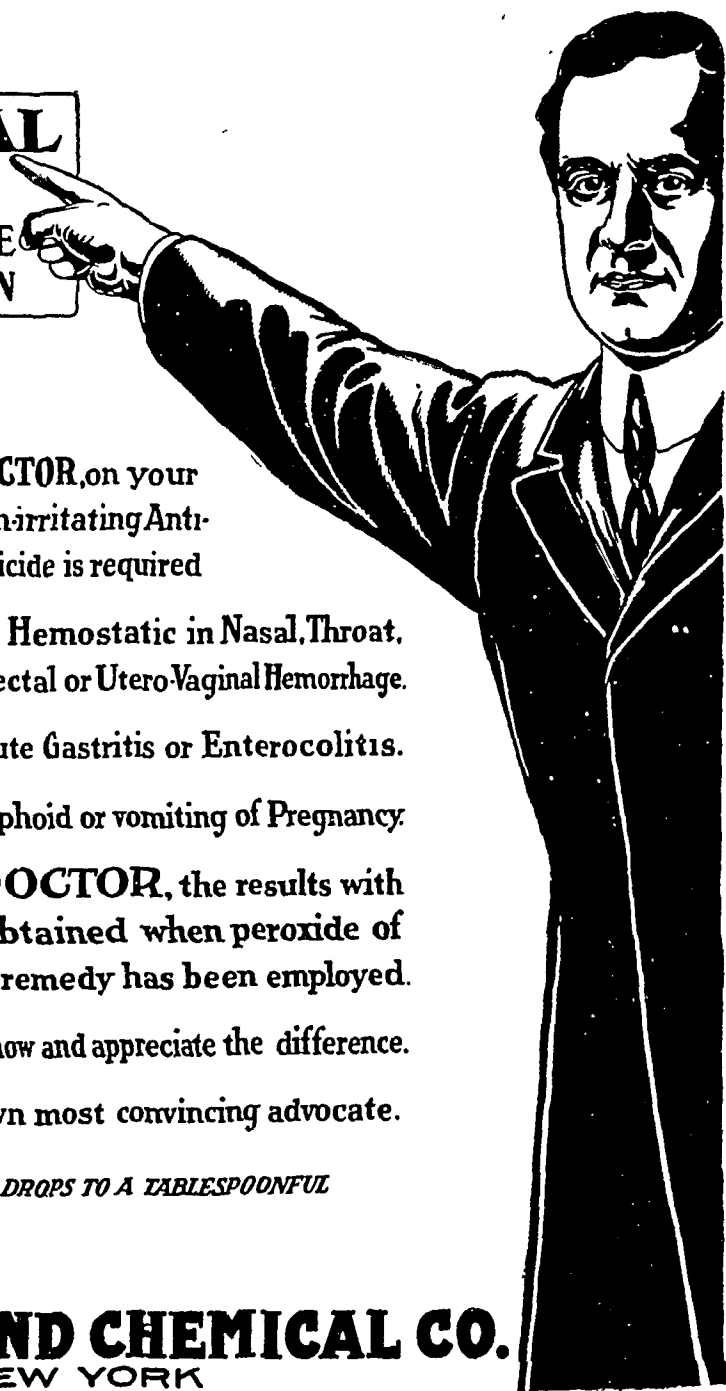
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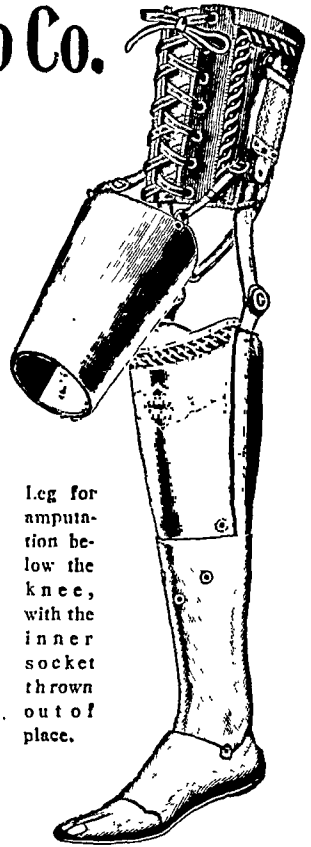
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# ANNALS OF SURGERY

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VOL. XLV

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## ORIGINAL MEMOIRS.

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### SEVERE BURN OF TOP OF HEAD AT SEVEN MONTHS OF AGE, FOLLOWED BY NECROSIS OF ENTIRE OSSEOUS CAP OF CRANIUM.\*

AT FOURTEEN YEARS OF AGE DETACHMENT OF THE ENTIRE CALVARIUM BY CIRCULAR CRANIOTOMY FOR EPILEPSY AND DEFECTIVE MENTAL DEVELOPMENT

BY WILLIAM WILLIAMS KEEN, M D.,

OF PHILADELPHIA

Professor of Surgery in the Jefferson Medical College

HARRY H W, at fourteen was admitted to the Jefferson Medical College Hospital, December 7, 1904, at the request of Dr W F Haines of Seaford, Del, with the following history At seven months of age his parents left him wrapped up in a shawl in a rocking chair in front of a wood fire, which then consisted chiefly of coals, while they went to attend to some farm work \* They also left an older child, about two years of age, to take care of him They were absent from the house for about forty-five minutes Upon their return they found that the baby in the rocking chair had begun to cry and the two-year old child had tried to climb into the rocking chair to comfort him In doing so the chair was overturned forward and the baby thrown into the fire, so that the top of the head was in contact with the live coals As nearly as can be ascertained by cross-questioning the two-year-old child and knowing the length of their own

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\* Read before the Philadelphia Academy of Surgery, February 4 1907

absence, the baby's head lay in the coals not less than twenty and it may have been thirty minutes. As a result of this severe burn, the scalp being thoroughly charred, the whole top of the head sloughed off about six months later, including a large portion of both frontal bones, the two parietal bones in their entirety, and a part of the squamous portion of the right temporal bone. The piece of the squamous bone was lost, but a photograph (Fig. 1) shows the other four pieces of bone their natural size. The four pieces of bone which have been preserved can easily be identified. They are of a dark brown color, the result both of the burn and suppuration. Placing them in position, they measure from front to back 17 cm., and from side to side 11 cm. When the bone sloughed away the dura was exposed, covered by that time with granulations. A year after the burn, the scalp was healed, and upon my recommendations (for Dr. Haines showed me the specimens and consulted me at that time) a tin cap covered with silk was made for the purpose of protecting the top of the head from blows, but it could not be used as it annoyed the child. Six months after cicatrix was complete, the scar broke down, and from that time till the present it has been alternately healed and open.

Soon after the accident he had nine convulsions. He was then free from them for over a year. Then he began to have distinct epileptic attacks. These have continued ever since and have increased in severity and frequency. They occur day and night regardless of any known influence, such as excitement, the direct sun's rays, etc. On an average, his father thinks he has about 400 attacks every year. Sometimes he goes several days without a spasm.

He began to go to school at seven years of age and appeared to learn rapidly. His memory was excellent till he was about eleven years old, when his epileptic attacks became more frequent and he became stupid. He was, therefore, removed from school, and he has forgotten most of what he learned and is becoming more and more deficient mentally. While at school he learned to read and write, but in the last three years he has lost the ability to do either.

*Physical Examination on Admission.*—He seems to be physically a well-developed boy of average height and weight, but his face presents a dull and stupid appearance. He responds rather

FIG 1



Photograph of the necrosed frontal and parietal bones, natural size and measuring when approximated, 17 x 11 cm

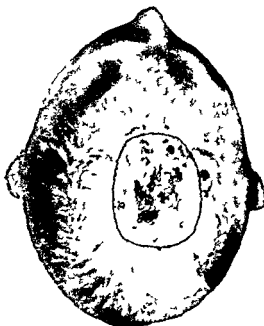


FIG. 2.



Photograph of the boy at 14 years of age.

FIG 3



Photograph of top of head. The dark line corresponds to the present opening in the bone and measures 8 x 5 cm. The original opening when the bones closed away at 13 months of age measured 17 x 11 cm (see Fig 1). While his head has increased in size with his growth the defect in the skull has contracted 9 cm antero-posteriorly and 6 cm transversely.

FIG. 4.



Williams 1568 12/24/04

Skiagraph (Jan. 10, 1905) showing the gap left in the bone by the complete circular subcutaneous craniotomy. Note also the evidence of loss of bone on top of the skull

indifferently to questions and talks, but can hardly be said to converse

His heart, lungs, and abdominal viscera are, apparently, normal. The deformity of his skull is very marked (Fig 2), showing a deep furrow a little to the right of the middle line, running obliquely from behind forward and to the right. On the top of the head there is a very large scar (Fig 3). The oval line in this photograph is an ink line showing the present area under which there is no bone. This measures only 8 by 5 cm. Corresponding to this oval line the margin of the bones can be felt quite distinctly, under the scar, pulsation of the brain can be seen, pressure on the area where there is no bone causes pain. There is also a scab at two or three ulcerated points. The scalp is as tense as a drum head over the entire top of the head.

His convulsions as observed in the hospital were at times chiefly manifested in the left leg and arm at other times in all four extremities. There was no localization of the convulsions.

Urine turbid, straw colored, 1017, reaction acid, no albumin or sugar was found, urea 1.6 per cent, no crystals, but amorphous urates, squamous epithelium, and a few leucocytes, no blood or pus. Dr Wm M Sweet examined his eyes and reported as follows. Normal pupils, normal ocular movements. Optic nerves good color, vertically oval. Arteries and veins normal, smaller twigs tortuous. The arteries in the right eye ground are a trifle small in proportion to the veins.

Dr Bochroch examined him from the neurological standpoint and reported as follows. Knee jerks are equal, no astereognosis, no Babinski, no ankle clonus, no impairment of sensation below the knees and no impairment of the muscle sense. No trophic ulcers, he stands equally well on both legs. There are ecchymotic spots on the arms, impeded circulation, cold sweaty hands, the radial arteries suggest hardening. The left hand, which was also burnt, is smaller than the right. The grasp is equally good in both. No atrophy of shoulder girdle muscles. No thermal anæsthesia. Pupils respond to light and accommodation. High arched palate, fairly good dentition. Hears the ticking of a quiet watch at about ten inches. Tendency to nystagmus laterally with the pupils turned to the right. No impairment of the sensation of taste.

After considering the possibility of doing any operation on

the top of the head, I decided that that held out little hope of relief from the pressure, and as the covering of the top of the head consisted of the dura and scar tissue intimately adherent together, it would be very dangerous and probably fatal to attempt any operation there. Moreover, I supposed that probably the superior longitudinal sinus might be blocked as a result of the burn.\* I decided, therefore, to do a complete linear craniotomy, so as to separate the entire top of the skull from the lower portion. To do this by an open incision of the entire scalp would almost certainly produce gangrene of the scar tissue of the top of the head. I therefore decided to make several incisions, say 4 to 5 cm. above the ears, and then by my craniotomy forceps to gnaw away a portion of bone about 7 mm. in width. I found that the scalp moved loosely over the skull at about the level indicated all around the skull, excepting at a small area over the right temple. I could, therefore, by undermining it, detach the scalp from the skull through the small openings and then, having made a small trephine opening in the bone, could detach the dura from the bone and do the linear craniotomy.

*Operation*, December 14, 1904.—I carried out my plan as above described, making the first incision a little back of and above the left ear. I got along without trouble (excepting that it was tedious on account of having to do a large part of the operation without the aid of sight) till I reached the middle line of the forehead. Here, unfortunately, the superior longitudinal sinus was caught in the bite of my rongeur and torn. I immediately checked the quite violent hæmorrhage by some iodoform gauze, extended the incision somewhat across the forehead to the left, rapidly made a trephine opening at this point and gnawed away the bone till I reached the point of the tear. I was able then by my finger to check the flow of blood sufficiently to see the bone well, and complete the craniotomy in the middle line. I packed some iodoform gauze into the opening, which effectually checked the hæmorrhage, and then discontinued the operation, having completed nearly one-half of it, and determined to do the other half a few days later.

In thinking over the matter I feel quite clear that the tear of the sinus was due to the fact that I did not adopt the proper

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\* The operation showed that this was not the case.

method in approaching this portion of the bone I should have continued the gnawing away of the bone till I reached almost to the middle line, then have made a trephine opening on the left side and gnawed away the bone on that side nearly to the median line, have exposed the sinus, and then by guarding it with my forefinger or some other suitable shield, such as the handle of a knife, I am quite sure I could have removed this piece of bone which projected inward more deeply than usual, at least 4 or 5 mm, with safety and I would not have torn the sinus.

December 20 1904.—He has done so well that I completed the craniotomy to day. Warned by my former experience, I attacked the superior longitudinal sinus posteriorly first from one side and then from the other, as just described, gnawing away the bone over the sinus itself last and without any trouble. The hæmorrhage was not at all severe. Eight incisions were made in performing the complete craniotomy.

Two days after the first operation, and one day after the second, he was sitting up in bed with a backrest. In the interval between the two operations he had two convulsions, December 18 and 19, with but very little twitching. Before the second operation was done it was clearly noted by the resident, his father and several surgeons who had seen him repeatedly, that his mental condition seemed to be distinctly improved even by the first operation. I hardly think that the wish was father to the thought, but, of course, it is difficult to express an unprejudiced judgment. The boy himself said that his head felt much better than before the operation. Very little pain followed either operation. His temperature after each operation only once exceeded 100 degrees.

January 9 1905 a skiagraph was taken (Fig 4). This shows well the absence of bone on top of the head and also the line of my linear craniotomy.

On January 10, 1905, just before his discharge, Dr Bochrach again examined him and made the following report. The patient's face expresses apprehension and lack of intelligence. A considerable interval elapses between his answers to such questions as "Where do you live?" "How many brothers and sisters have you?" etc. There is apparently no paralysis of the muscles of the face, he is, however, unable to draw his cheek from either side in order to show his teeth. Most likely this is

due to lack of understanding of what he is expected to do. The eye-balls have a tendency to twitching, or a slight jerky movement; possibly more marked in the right than the left eye. When following an object, especially toward the right side, lateral nystagmus is distinct. The pupils are somewhat dilated, but respond promptly to both light and accommodation. There is a fine tremor of the tongue; also a fine tremor of the hands, more marked in the right than in the left. Grasp good and equal. His walk suggests the "steppage gait;" this is exaggerated when walking with his eyes closed. During this test he always walks to the right. He has no Rombergism, but he stands with difficulty on either leg, with his eyes closed. The knee jerk on the right side is exaggerated, on the left side rather minus. No Babinski or ankle clonus. The reflexes in the upper extremity, wrist, biceps and scapulo-humeral, are exaggerated. Tactile and thermal sense normal, though he occasionally gives evidence of paræsthesia. No asteriognosis.

He left the hospital on January 7 to visit an uncle in the neighborhood, but returned to the hospital on the tenth and then went home. His peculiar gait mentioned in Dr. Bochrach's last examination was improved, and his general and mental condition also were improved.

After the second operation, his convulsions were as follows: December 23, 5 minutes; December 24, 5 minutes; December 28, 7 minutes. They were chiefly on the right side and the mouth was drawn to the right. December 30, two attacks, 6 and 3 minutes long respectively, similar in type to the one on the twenty-eighth. December 31, one attack, duration 5 minutes. There were no movements on this occasion on the right side, but only a clonic spasm of the left arm and leg, and the face was strongly drawn to the left.

October 26, 1906.—He was shown to the Society of Clinical Surgery in a clinic which I held at the Jefferson Medical College Hospital. His father states that he has had fewer attacks and that his intelligence is slowly improving. The ulcers on the top of his head are rather worse than when I last saw him two years before and cover the central half of space where there is no bone.

A new skiagraph taken at this time shows persistence of the gap seen in the first skiagraph, but the edges of the gap are, of course, rounded off and less sharply defined. The width of the

gap in the bone is the same as immediately after the operation Dr Haines writes me, January 25, 1907, that the top of the skull does not seem to him to be movable

### REMARKS

That the baby did not die from the accident is extraordinary, but it is not a cause of astonishment that he should develop an abnormal shape of his head or an abnormal mental condition accompanied with epilepsy

That popular myth, "pressure on the brain," is certainly realized in this case, as shown by the deep furrow on top of his head and by the measured contraction of the original defect in the skull His head, though of very abnormal shape, is of the average size for a boy of fourteen Hence the head has enlarged very much since the bones exfoliated thirteen years before But instead of the opening left by this exfoliation enlarging *pari passu* with the growing head, it has greatly contracted Adjusting the necrosed bones accurately together and exclusive of the lost piece, the aperture left by their exfoliation must have been 17 by 11 cm At fourteen years of age this opening had contracted to 8 by 5 cm Not only had contraction taken place in the horizontal plane, but the deep furrow on top of the head shows that a marked contraction had taken place in the vertical plane

That the epilepsy and mental dulness have been caused by the contraction and consequent pressure, and by the physical alteration in the structure of the cortex itself by the burn, I think there can be no doubt The only wonder is that he is not wholly idiotic as well as epileptic

While I had little hope of benefitting the boy by any operation, it seemed to me he ought at least to have the possible chance of benefit from the relief of pressure, provided such an operation would not be almost certainly fatal As described in the notes, my idea was to make the entire calvaria movable so that it could be lifted like a lid on top of the head If, then, the brain had any power of expansion it might lift the calvaria and so get more room



The apparent immediate result seemed to promise considerable improvement, but after two years I fear that this will be slow in its progress and will not be as great as could be desired. Yet the lessened frequency of his epileptic attacks is a positive improvement and he is certainly somewhat less dull than he was when I first saw him.

# THE SURGICAL TREATMENT OF TRIFACIAL NEURALGIA.

WITH REPORT OF EIGHT CASES OF RESECTION OF THE GASSERIAN GANGLION

BY FRANK MARTIN, M.D.,

OF BALTIMORE, MD.,

Clinical Professor of Surgery in the University of Maryland

ON September 12, 1892, I had the pleasure of assisting Dr L. McLane Tiffany in doing a Gasserian ganglion operation according to the Hartley-Krause method, here in the city of Baltimore. It so happened that it was the first one that had ever been performed here, and followed soon after the introduction of the Hartley Krause method. That patient, I may say, did perfectly well and is still living to-day, and has had no recurrence of pain whatever since operation. In her case she had been operated upon a number of times, having had done all the peripheral operations with a temporary relief following each one, and then recurrence of all the trouble.

Dr Tiffany was not only the pioneer, I might say, in this city, but did a vast deal for the progress and advancement of this work, and his results were better than any operator at that time. He also published a most excellent and exhaustive article entitled, "Intracranial Operations for the Cure of Facial Neuralgia," giving his experience with a large number of cases and also collected and tabulated all the work that was done in this line up to the time of publication of his article. This article was published in the "Transactions of the American Surgical Association," volume XIV, 1896, and in ANNALS OF SURGERY, November and December, 1896. In this article Dr Tiffany goes over the entire subject most thoroughly, having collected in all 108 cases, and gives a brief history of each one. Of these cases nearly two-thirds were subjected to the Hartley-Krause operation, nearly one-fourth to that of Rose, 7 to that of Horsley, 4 by the method of Doyen, Quenu 4, and Novaro 1, while 1 is uncertain since no method is mentioned. There

were 47 operators, 25 of them operating once each. The outcome of his research in this line shows that out of 108 cases there were 24 deaths, a mortality percentage of 22. The principal causes of death were put down as shock and sepsis. This report includes 10 cases operated upon by Dr. Tiffany himself; this shows his mortality to be less, namely, 2 deaths in 10 cases. Dr. Keen's cases in this tabulated article show 2 deaths in 10 cases likewise. It will also be noted in looking over the ages recorded in these various tabulated cases that the vast majority of the cases were markedly advanced in life, feeble, and had been worn out by long-continued suffering, and it is surprising to note how well they stand the surgical shock of this formidable procedure. In my series of cases, likewise, the age limit has been well advanced; the cases have universally been aged people.

I had the privilege of assisting Dr. Tiffany in most of his own personal cases and am in a position to speak accurately of the great skill with which he performed and accomplished these operations. The mortality following his work was low, as shown above, and the results so far as relief of pain were absolutely perfect, and he should be given great credit for having perfected the operation in a marked degree. He by no means adhered strictly to the Hartley-Krause method, but departed from their method in many points where the change was for the bettering of the method of approach and a proper access to the ganglion. For instance, he soon gave up the osteoplastic flap and took away sufficient amount of bone in order to enable him to have good access to the middle fossa. It was only in the very earliest cases he attempted to put back the bone flap, and I might here state that in none of his cases, so far as I remember, were there any permanent serious complications following the operation. There were some temporary eye disturbances, which all cleared up in a short while, save for one case (Case CVI in his series), where a second operation was done; the patient at the time of operation having a well marked and bad corneal ulcer. In this case the patient recovered and pain was abolished, but eye was lost.

It has been my experience to do all the peripheral operations where the trouble has been limited to one or more nerves with the usual results of temporary relief, most of those cases, however, have come later on for the ganglion operation. In some few of the ganglion operations that I have done, in fact most of them the peripheral operations have been done by some other surgeon with the usual results namely, recurrence of pain before they came for the more serious ganglion operation. I have in several of my cases however, done the ganglion operation primarily without resorting to the division of the nerves, in those cases it has seemed clear to me that nothing short of a ganglion operation would give them relief.

In my first cases I made use of the Hartley Krause method, since then I have used a lower route, dividing the zygoma and discarding the osteoplastic flap, going lower in temporal fossa and biting away the bone in order to make my opening sufficiently large. This is a method very similar to Cushing's method. I have never yet strictly confined my opening in the skull to the arch under the middle meningeal artery, but often get into the artery, and if so tie it in the dura. The dura is then stripped up from the middle fossa down to the second division of the fifth, then the third division is sought for, the dura is then split between these two roots and the top layer of the ganglionic sheath is raised and the ganglion uncovered.

The recent results following removal of the ganglion in toto have been as I said before most satisfactory and most permanent in the cases that have been watched for any length of time. Whether the recurrence of pain will follow that is a subject difficult to know, due to the short period since many of the operations have been done. It seems to be pretty definitely settled that total removal of the ganglion as distinct from a partial operation is attended by permanent cessation of pain. It is certain so far as the physiologic knowledge of the process of nerve repair goes that there can be no peripheral regeneration of the system of sensory neurons after a thorough removal of the ganglion so that those that come out successfully from a well conducted operation are relieved of their pain at least even

if they do have possible eye complications. There have been some temporary eye symptoms in almost all of my cases. In my last one the sixth nerve was interfered with for quite a while, and the man had paralysis of the external rectus and certain amount of diplopia, which cleared up entirely after several months. The great drawback to the advancement of the operation has been the high mortality attending it. I think the keynote of the successful accomplishment of the operation is the avoidance of hæmorrhage, and if this can be accomplished the operation is generally not attended by any great degree of shock. I am convinced it has been the cause of the majority of deaths. Sepsis and brain infection should be avoided. Hæmorrhage explains, doubtless, the high mortality variously estimated at 20 per cent. This is needlessly high, however, and should not be; and I am convinced that if the statistics of the operators who are doing most work in this line were looked into the percentage mortality would be found much lower. In a recent monograph by J. Hutchinson, Jr., on "The Surgical Treatment of Trifacial Neuralgia," he goes over the subject very thoroughly and calls attention to the work of Sir Victor Horsley, whom, he states, has performed 120 operations with but 6 deaths; so, likewise, with the work of other operators, I think the statistics will show the mortality to be very much less.

The avoidance of hæmorrhage is at times an exceptionally difficult thing in my experience. I think I voice the sentiments of almost every surgeon when I say it is the principal thing we fear, and I venture to say that it has been the experience of almost every surgeon to meet with serious hæmorrhage in one or more of his cases. I am convinced that in one of my cases the death was unquestionably due to the amount of blood lost during operation. In those cases where I have not had hæmorrhage to annoy me the patients have made uninterrupted recoveries; their pain being immediately relieved and their progress most satisfactory, in fact, have been up in the course of 36 to 48 hours. After this their recovery is speedy, and as a rule they are out of the hospital at the end of a week, with

wound entirely healed It is astonishing to see how rapidly these patients convalesce, as was mentioned above, most of them are well advanced in age and their resisting powers generally have been weakened by long continued pain, and it is perfectly surprising, that when they do do well, how rapid their recovery is and how little their general health is interfered with during convalescence

The operation is one in my judgment absolutely not an operation to be demonstrated to a class It is an operation that requires all the dexterity that a skillful operator can possess, and it is one that he is unjustified in attempting to let those who are looking on attempt to see, by doing this he not only wastes time but is apt in his demonstration to do damage and get into a hæmorrhage which may cost the life of his patient. I believe that the proper procedure is to do it slowly, carefully, and to center one's entire attention on it and not attempt to stop and let others see The first assistant is the only one that can see anything It is done through a small opening and the work is to be done between intervals of hæmorrhage which well up from deep down in middle fossa Pressure will usually stop without difficulty these hæmorrhages that well up, and after they have been stopped by pressure maintained for a short while, then one proceeds on in endeavoring to enucleate and free the ganglion from its bed By working carefully around the third division and slowly progressing backwards towards the pons one can in this way get at the back of the ganglion, or sensory root, without encroaching upon and endangering the patient's life by opening into the cavernous sinus If the ganglion can be worked free from its bed in this way it can be sectioned across behind the ganglion without undue hæmorrhage The sectioning across of the sensory root back of the ganglion is the most essential step in getting a complete subsidence of the pain When this is done successfully it cuts off completely all the sensory distributions conducted through the various branches of the fifth nerve, and it is a matter of no special moment whether the ganglion is left in or whether it is removed, the division back of the ganglion is the most im

portant thing, and pulling forward the divided distal end is all that is necessary, so that it cannot reunite with the proximal end; by pulling it forward so that regeneration cannot become established is all that is necessary, and the actual pulling out of the ganglion, which may be attended by serious hæmorrhage, can be avoided. When the attempt is made to get it raised out of its bed before it is well worked up from behind, one always has difficulty with serious hæmorrhage and one is liable to tear into the cavernous sinus. The top layer of the ganglionic sheath should be separated from the ganglion first, until it is well uncovered, and no attempt should be made to separate the ganglion from its under ganglionic sheath until all the other work has been completed. It is an operation that is so trying on the operator—so tedious and so long drawn out—that a day should be set apart for it, with nothing else attempted on that day—certainly no operation before a Gasserian ganglion is done. I do not know how it is with other operators, but it takes me a number of hours to complete one satisfactorily.

I wish to append a brief report of the eight cases. The first two cases were done by the Hartley-Krause method with the osteoplastic flap, but in neither of them was bone replaced. Others were done by lower incision, followed by division of the zygoma and the skull opening made low down in temporal fossa, first with the chisel and then with rongeur forceps. In my recent cases the anterior arm of the incision has been so planned as not to divide the nerve going into the occipitofrontalis, which when divided, causes drooping of the eyelid and disappearance of wrinkle of brow on that side. In this list of cases it will be noted there have been two deaths; one from ether pneumonia, and the other from shock, unquestionably brought about by hæmorrhage at time of operation.

CASE I.—Female, white, aged seventy; operation November 30, 1899.

*Previous History.*—Had suffered with trifacial neuralgia for five or six years. No peripheral operation had been done previously. It had apparently invaded all the branches. Operation. Hartley-Krause. The ganglion was removed. Immediate result.

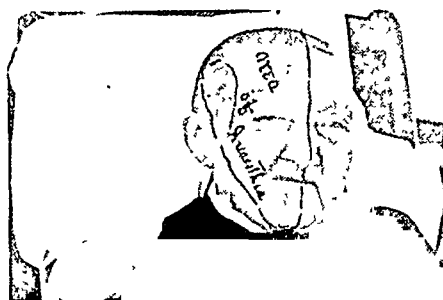
FIG. 1



Gasserian ganglion removed December 28 1892. No 1 Sensory and motor root  
No 2 Third division (inferior maxillary) No 3 Second division (superior maxillary)  
No 4 Where it was torn loose from first division The specimen has been so turned over  
that it does not show it in the proper position



FIG. 2.



Mrs. M. E., white, aged 75, operated upon Dec. 28, 1899, for facial neuralgia. Entire Gasserian ganglion removed. Picture taken ten days after operation. Right side of face inside of pencil marking shows area of complete anæsthesia to touch, pain and temperature changes.

Abolishment of pain, patient made uneventful recovery, healed under one dressing. Ultimate result. No recurrence of pain.

*CASE II—Removal of the entire Gasserian ganglion and its sensory and motor roots back nearly to the pons, as a primary operation for the relief of facial neuralgia, involving the three divisions.* Female, white, German, aged seventy five, operation December 28, 1899.

*Previous History*—She was a typical sufferer with trigeminal neuralgia for five years, involving all three divisions of right fifth. Attacks were less frequent at first but very severe from their incipency, increasing in frequency and severity until the last six months when they have become almost constant.

*Previous Treatment*—Medical treatment of all kinds had been resorted to, morphia in large doses would not alleviate, no operative interference of any kind had been done. On account of involvement of all three divisions, primary removal of the Gasserian ganglion was done.

*Operation*—Hartley Krause. Osteoplastic flap, which bone flap was not put back. When the skull was opened and the osteoplastic flap turned down the second division of the fifth at the foramen rotundum came into view first, after the brain was lifted from middle fossa, the third division at the foramen ovale was next seen and the ganglion soon uncovered. The two divisions, third and second, were cut across and the ganglion picked up by a pair of artery forceps and evulsed from its bed and a long piece of the sensory root came away with it (as shown in Fig 1). There was an excessive flow of blood and I feared I had torn into the cavernous sinus. Pressure was made by gauze pledgets, when these were removed blood still welled up, so I presume the cavernous sinus was torn into. I packed this cavity with two pieces of tampon sterile gauze, bringing them out at the lower angle of wound. The flap was replaced and wound closed with subcuticular silver-wire sutures. To prevent foreign body getting on anæsthetic cornea I closed the eye by suturing the lids together. Immediate result. Patient reacted nicely and expressed herself as entirely free from pain, the relief of which was complete and permanent. The sutures were removed on the fifth day and the lids were opened, no irritation whatever about the cornea. A Butler's shield was placed over the eye and worn. At the end of ten days all dressings were removed.

and wound entirely healed, as will be seen by accompanying photograph; the patient was entirely free from all pain. The markings on photograph indicate area of anæsthesia\* (Fig. 2).

Examination of patient four weeks after operation is as follows: Muscles supplied by left branches of facial show normal innervation. When patient compresses teeth forcibly the right masseter muscle does not stand out as prominently as the left, since it is less forcibly contracted, one can readily palpate this difference in the hardness of the muscles on both sides when thus contracted. Pharyngeal reflex normal on both sides. No evidence of any vasomotor irritability about the face, the color being in general rather pale. Sense of taste dulled on anterior two-thirds of right half, patient being unable to distinguish sour or sweet substances, but distinguishes very bitter (quinine and, strange to say, salt). Slight dulling to temperature and pain on right side of tongue. Both eyes are moist; no particles of dust in right cornea, which is perfectly clear. Pupils equal and react well to light and accommodation. Tongue in median line. No paralysis of any facial muscles except right half of frontalis, which is almost completely paralyzed, not the orbicularis, however. This paralysis may be due to cutting the nerve supply of the muscles in large flap operation. Ultimate result: Recovery and permanent cessation of pain.

CASE III.—Male, white, aged seventy-six; operation March 14, 1901.

*Previous History.*—He had had facial neuralgia for a number of years.

*Previous Treatment.*—Two or three years prior to my operating upon him he had had a peripheral operation done for the removal of the third division through angle of jaw by Dr. Tiffany. This gave him temporary relief, but it returned with all its vigor, attacking other branches of the fifth. He was suffering excruciating agony, with the pain ranging through all three divisions.

*Operation.*—Hartley-Krause. I got the ganglion beautifully uncovered and removed it as neatly and nicely as any

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\* This is among my earlier cases and the scar is very pronounced; in my later cases the opening has been much smaller and the depression is not nearly so marked.

case I ever did, and had practically no trouble whatever. He reacted nicely, but unfortunately, as it was a ward case I did it in the amphitheatre before a large class of students, it was a bitterly cold day and considerable time was taken up in endeavoring to demonstrate to the students the ganglion in its bed, this naturally prolonged the operation and prolonged the effects of ether. Immediate result. His wound did perfectly well and was practically all healed, but the day following operation he developed ether pneumonia which ran a fatal course, and on morning of fifth day following operation resulted in death. This death should not be attributed to the ganglion operation, because the case was done perfectly quietly with no disturbance whatever, no hæmorrhage of any consequence, and no shock, it was purely a case of ether pneumonia, and really should not be attributed to the removal of the ganglion, because it would probably have occurred from any operation.

CASE IV—Female, white, aged fifty one, operation November 7, 1903

*Previous History*—Began with attacks of neuralgia in lower teeth

*Previous Treatment*—Her teeth had all been removed at various intervals without alleviation. In 1891 Dr Tiffany divided the inferior dental branch in the foramen at the angle of the jaw, this gave her relief for seven months, when a pain recurred not only in the inferior dental branch but in the inferior maxillary, and was more intense in second division, so a second peripheral operation was done by Dr Tiffany, the superior maxillary was removed by incision just under orbit, large section of nerve was removed by twisting and contortion. She returned to the hospital November 5, 1903, complaining of neuralgia in violent form, the last peripheral operation gave her relief for five months. She came in this time complaining of pain distributed over entire region of fifth. On entrance she stated she had been suffering constantly, getting worse and worse each day, since July 1, 1903. (I failed to note that the supra-orbital nerve was also cut previously.)

*Operation*—Right Gasserian ganglion was removed November 7, 1903. The method of approach was a little different from the Hartley-Krause method, flap was made lower and opening

in skull was made lower and enlarged sufficiently to enable me to have access; zygoma was divided and skull entered much lower. A horse-shoe incision, having for its base the zygoma, about  $1\frac{1}{4}$  inches wide at this point and about two inches high, was made, cutting through the skin, muscle and fascia. The zygoma was then exposed and cut at each extremity, and flap of skin and muscle and fascia retracted with the zygoma. The periosteum being peeled back, a small area about one-half inch in diameter was then chiselled out and the opening enlarged with rongeur forceps to about one inch in diameter; this exposed the dura with the middle meningeal, which was ligated with two silk sutures and cut between. The dura and brain were then lifted gently from middle fossa and second and third divisions came into view, and by dissecting between these two the ganglion was soon uncovered and removed without difficulty. Certain amount of bleeding occurred when ganglion was gotten away, which necessitated a bit of gauze being left in for pressure and brought out at lower angle of wound. The soft parts were replaced and flaps stitched around with interrupted stitches of fine silk; at the first dressing intervening stitches were removed and in that way left practically no scar. Immediate result: Patient was somewhat shocked but soon rallied and made an uninterrupted recovery; the gauze packing was removed at end of thirty-six hours and wound allowed to close; at the end of a week she was up and about with wound entirely healed. The eye symptoms following operation were temporary, consisting of dilated pupil, some fixity of eye, and ptosis; this all cleared up in a few days and then disappeared entirely. Ultimate result: Recovery; no recurrence of pain. The highest temperature in this case was 100; it reached normal on second day after operation and ran normal balance of stay in hospital. She was dismissed from hospital as cured on tenth day.

CASE V.—Female, white, aged fifty-seven; operation December 2, 1903.

*History of Disease.*—Has had persistent neuralgia for twelve years. Twelve years ago the trouble began with creepy sensations along the right cheek which became very annoying, but to which she gave no significance after probably four months. Then she was suddenly taken with this intense neuralgia which lasted

a few minutes and then passed off, this history went on, trouble growing worse each month, disappearing and recurring at intervals

*Previous Treatment*—In 1901 Dr Tiffany did a peripheral operation, resecting the supra and infra orbital nerves on right side, which afforded relief until February, 1902 (nine months) At this time the attacks began again, of the same character but with more intensity and more frequency, persisting through several days and then disappearing for a month or more This history of recurring pain continued until she entered the hospital November 29, 1903 She then complained of paroxysmal attacks of the most excruciating character, continuing for about one minute and recurring at intervals of about five minutes The pain comes on as a sharp penetrating pain, to use the patient's own words, "Like a red hot vice twisting the nerves," radiating over the eye, under the eye, along the cheek back to the ear and along roof of mouth on right side When in a paroxysm patient seems to suffer most intensely, cries quietly and presents a most pitiful picture, with tears running from the eye and water dropping from the nose Physical examination She is a large, well built, well preserved woman, in good physical condition.

*Operation*—The method of approach was a little different from the Hartley Krause method, flap and opening in skull were made lower, zygoma was divided and skull entered much lower A horse shoe incision, having for its base the zygoma, about  $1\frac{1}{4}$  inches wide at this point and about 2 inches high, was made, cutting through skin, muscle and fascia Periosteum was peeled back, chisel being used for opening skull, which opening was enlarged by rongeur forceps, brain was lifted from middle fossa, the second and third divisions were clearly seen and the capsule of dura covering ganglion was stripped from off top of ganglion and second and third divisions were cut and ganglion removed There was considerable hæmorrhage in attempting to uncover and isolate ganglion The wound was closed in my usual way, using interrupted silk sutures and dressings applied Immediate result Patient was very little shocked, pain abolished immediately upon awakening from anæsthetic, wound healed and no reaction followed operation She was sitting up on third day and left the hospital on tenth day, no unfavorable eye symp

toms in this case at all; motion unimpaired. She wore a Butler's shield to protect the eye from foreign bodies and cornea was anæsthetic. Ultimate result: Recovery, and has had no recurrence of pain.

CASE VI.—Female, white, aged seventy-eight; operation March 20, 1906.

*History of Disease.*—She has had neuralgia involving two lower branches of right fifth for the last fifteen years; the beginning of it was apparently in her third division, and four or five weeks after it began in the third division it started in the second division; there has never been any pain referable to the first or ophthalmic division. Has never had any previous operation.

*Operation.*—The second and third divisions were removed and with them part of the ganglion, which came away by torsion. Immediate result: Cessation of pain and uninterrupted recovery. Ultimate result: So far there has been no recurrence.

CASE VII.—Male, white, aged fifty-seven; operation March 27, 1906.

*History of Disease.*—He has suffered with trifacial neuralgia for the last twelve years, having intervals of quiescence; during last several months has had to stay away from business on account of the severity of the attacks which are now almost constant. The first and second division of the fifth seem to be at fault. I advised a Gasserian ganglion operation and sent him to the University of Maryland Hospital.

*Operation.*—Under ether I made a horse-shoe incision in the right temporal region extending up from the zygomatic arch about 5 cm.; the base of the incision was about 4 cm., which corresponded to the zygomatic arch. The skin flap was dissected down to base line of this flap and the temporal fascia was opened, incision running in similar way to the skin incision, but the size of this flap was smaller from one-half to three-fourths of an inch; this was turned back likewise. I uncovered the zygomatic arch, stripped back periosteum from it, and with strong biting forceps cut it across; the periosteum was likewise separated from it back near to temporal bone and there cut across in order that the zygomatic arch could be pulled down with the soft parts, thereby enlarging the space. A similar horse-shoe flap was then

made through the temporal muscle, still smaller in size than the fascia, this went down to the periosteum of the skull and it was pulled down with the zygomatic arch, and the skull uncovered deep down in the temporal fossa, a small trephine was then inserted and a small groove started in the bone, I abandoned the trephine and took a chisel and opened the head at this point, as soon as the bone was raised, or skull entered there was bleeding from a branch of the middle meningeal artery by making compression over this I was able to stop bleeding, and then enlarged opening by rongeur forceps to size of half dollar, biting downwards, so as to get down to base of fossa as far as possible First the rongeur forceps bit away a portion of the temporal bone and then a greater wing of the sphenoid, there was very little bleeding during these steps of the operation to get into the skull, the bleeding points were arrested most of them tied off Then with a brain elevator I stripped up the middle lobe, with its dura attached, from the middle fossa and soon came down upon the foramen ovale, through which passed the third division of the fifth, after getting that located I separated the dura attachment between the third and second divisions with a knife, and with my Gasserian ganglion spoon the dura which made the top layer of the ganglion was stripped back uncovering the ganglion on top, during this there was some little bleeding, but not much In elevating the dura I elevated the arch of the middle meningeal artery, so that it could be clearly seen coming out of the foramen spinosum I failed to note however that when the foramen ovale came into view, there was a marked prominence of bone known as the crista infra temporalis, or ridge of bone projecting up in the fossa, interfering very markedly with the structures in the region of the ganglion, this I had to chisel and bite away with the rongeur forceps before I could proceed with the extraction of the ganglion By proceeding slowly and stripping up the upper layer of dura I was able to liberate the ganglion, definitely and clearly showing its three branches going off I proceeded slowly behind and was able to isolate the sensory root proximal to the ganglion, this root was gotten up and held by forceps, a loop was passed around the second and third divisions and silk ligature passed around, they were pulled up and cut across with scissors close to the foramen, then with the forceps attached to the sensory root I tried to evulse the ganglion with



the sensory root from its bed; this root was torn across and a small bit of the ganglion came away with the forceps, but in doing this I must have torn into the sinus, because there was a great deal of bleeding which was more or less easily controlled by packing with gauze, but it did not stop sufficiently for me to continue in enucleating the balance of the ganglion; every time the gauze was taken out the bleeding would go on to such an extent I could not see what to do. This continued for quite a while, and as the patient had been under the anæsthetic for a long time, and the bleeding did not seem to be stopping, and in view of the fact that I had torn across the sensory root proximal to the ganglion and had cut across the second and third divisions of the fifth and had enucleated the ganglion from its bed thoroughly, I decided I had better abandon the attempt to get the rest of it away for fear he would not recover; so I packed a small bit of gauze at the site of the bleeding and closed the wound by layers; first, the temporal muscle was brought up and stitched to its cut fibers; then the fascia was brought up and stitched, and the skin flap likewise brought back into position and fastened by interrupted sutures of fine silk. The whole wound was closed except for this small drainage which came out at the lower and posterior angle of the wound next the ear. Immediate result: He reacted from operation fairly well and was in pretty good shape.

March 30, 1906.—He had immediate quiescence of pain through the distribution of the fifth following operation, and had complete anæsthesia all over the region of the fifth distribution; he had some reaction the first twenty-four hours and some slight elevation of temperature and complained of great pain in his back, in lumbar region, and in back of his neck; this I attributed to the long position on the operating table, because he was on there at least four hours; he went on the table with a certain amount of lumbago and I think it was made worse. The dressings were changed on March 29, forty-eight hours after operation, and the gauze packing was removed entirely. There had been considerable oozing, so I put back a very small piece of gauze only a short distance in the drain track. On the thirtieth I dressed him again, took this out, and there was considerable cerebrospinal fluid which came out following it, and with each pulsation of the brain there was a drop of this cerebrospinal fluid which oozed out; a

small wick of gauze was put back again on account of this fluid draining. A number of the sutures were removed here and there, wound is healing primarily and all is going well, has had no discomfort whatever in face, some pain in back, but none in back of neck.

April 2, 1906—On April first I removed all further sutures from his head and left out all gauze packing, his wound healed primarily, pain has entirely abated, his eye shows signs of paralysis of the external rectus muscle showing that there is either temporary or permanent paralysis of the sixth nerve, because it does not work. The conjunctiva of the eye is clear, but right over the pupil there seems to be a little speck which at first looked like a foreign body, but I am fearful that it may mean the beginning of conjunctival necrosis which is the forerunner of conical ulcer. The eye was washed out with borax solution, there is absolutely no sensation in the conjunctiva. Ultimate result. Recovery. Eye symptoms all cleared up, and he has had no recurrence of pain whatever.

CASE VIII—Female white, aged thirty six, operation August 9, 1906

*History of Disease*—Has had pain in right side of face since last September. The pain involved practically all divisions of the fifth.

*Previous Treatment*—Has had all her teeth extracted without obtaining relief. Entered University of Maryland August 4 1906.

*Operation*—Under ether I opened down by making a horse-shoe flap in right temporal region, dissected skin back a certain distance and then cut temporal fascia around, less large than skin flap, divided zygoma, sectioned it across and cut temporal muscle down to bone. The temporal muscle was pulled down with temporal fascia and section of zygoma and skull uncovered down near base. Then with a chisel I made a small opening in skull as far down as I could get and bit away sufficient opening to enable me to get inside middle fossa. Then with brain retractor I pushed brain and elevated it away from middle fossa and worked my way down to second division of fifth nerve as it goes up to foramen, after getting that well exposed I divided between it and third division the envelope of dura which holds in place the

ganglion; I then stripped the upper end of dura back and uncovered the ganglion. I had considerable bleeding, but finally got it so I could see the ganglion clearly and showed it to a number of lookers-on. I then passed with a long needle a string around second division and began to enucleate the ganglion from its bed; there was considerable bleeding. I then got around third division of fifth, got it up and cut it across. I put a clamp on ganglion side and cut second division across; then with a clamp on ganglion I endeavored to get it up out of its bed; the clamp pulled off, bringing away only a small bit of ganglion; this was followed by considerable oozing; endeavoring to get this oozing stopped I pushed ganglion well up out of its bed, up above middle line of base; by using gauze pledgets to stop the oozing I finally got this sufficiently stopped to seek for rest of ganglion and endeavor to remove it. After getting field clear I put down a pair of hysterectomy forceps and tried to grasp remains of ganglion; I thought I had clamped it and made a pull on it, and when I did so, a tremendous whirlpool of blood gushed out, so I presume I tore the sinus; the clamp came away and I packed as quickly as possible large pledgets of gauze down in middle fossa to arrest hæmorrhage, which was more profuse than any I have ever seen in a ganglion operation. I finally got it controlled by pressure, and after holding it for a little while I thought I would remove this packing and see if hæmorrhage had been controlled; in attempting to remove it the same whirlpool of blood came out, not venous bleeding but arterial hæmorrhage. I packed it as quickly as possible, but it welled out all around and told very markedly on patient. This seemed to control it and I made a third attempt to remove this tight packing to see if I could not get on with less packing and see if pressure had controlled it. The same thing occurred on third trial; the gushing of blood was equally terrific and told on patient; her pulse went up and she showed evidence of hæmorrhage, so I packed it as speedily as possible and left in a large piece of gauze which practically filled middle fossa, and by making firm pressure on it the hæmorrhage was stopped. Then I brought temporal fascia lightly together with fine silk and brought the skin flap up in place and stitched it around, leaving gauze coming out of the wound just in front of the ear. I put on dressings, bandaging them tightly so as to make pressure continuous to control further bleeding. When

she went off the table her pulse was quite weak, feeble and rapid When I left the hospital her pulse had toned down and pupil dilatation had contracted considerably, there was an enormous dilatation in right eye which showed evidence of pressure against motor oculi Result Patient died from shock the morning following operation

# REPORT OF A CASE OF HÆMOPHILIC KNEE JOINT. OPERATION; RECOVERY UNDER THE USE OF THYROID EXTRACT.\*

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N. G., a waiter, twenty-two years of age, was referred to me for trouble in his knee, by Dr. Geo. C. Clarke of this city. The family history is negative so far as bleeding is concerned. His mother died when he was an infant; his father and one brother are living and well.

His personal history is that at five years of age he had suppurating inguinal glands, but had none of the diseases of childhood. Cuts or injuries occasioned no greater hæmorrhage than occurs in the ordinary individual. He had during boyhood an attack of nose-bleed continuing daily for several weeks, but without any deleterious effects. Prior to my seeing him, he had two hæmorrhages following biting of the tongue, each of which lasted for about three weeks and left him much exhausted by the loss of blood. The last one of these occurred within the past two years and he was cared for by Drs. Clarke and Page at the German Hospital.

When first seen, in March, 1906, he was extremely anæmic and sallow. He had not had good health for several years and constantly suffered from pain and soreness in his left knee. This trouble began when he was twelve years of age, at which time he fell, injuring the part slightly. Little attention was given it until the third day after the injury, when, following a long walk, the knee became greatly swollen and very painful. After two weeks' confinement in bed, the knee recovered entirely, but at irregular intervals of from one month to one year the joint has been swollen and painful just as after the first injury. Any overuse of the part sufficed to relight the trouble until finally

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\* Read before the Philadelphia Academy of Surgery, February 4, 1907.

tenderness became constant in spots and more especially on the inner side of the patella. Marked enlargement finally occurred and function became impaired. Flexion beyond 60 degrees was impossible but extension was normal and walking was not painful. A slight fall or forced flexion would cause an outbreak of pain and swelling severe enough to put him in bed for two or three weeks. As no history of bleeding was obtained at this time, the condition was considered a chronic synovitis of probable tubercular origin with thickening of the synovial fringes. Local applications of ung. ichthyol and similar remedies were used without benefit. Plaster of Paris was applied for six weeks and the use of the part much restricted, but without appreciable results. An X ray plate made shortly after coming under observation showed thickening of the soft structures but no apparent alteration of the bony. The condition finally became so troublesome that he was unable to continue his vocation, and operation was advised for the removal of a supposed hypertrophy of the ligamenta alaria just below the patella. He had been taking the Syrupus Ferri Iodidi for several months with some improvement in appearance and general health. He entered the Methodist Hospital on July 17, 1906, and was prepared for operation which was done on the following day. Attention was directed to the attacks of lingual hæmorrhage, but on account of the absence of bleeding in any other portions of the body following cuts, etc., these were considered as due more to the condition of anæmia and the vascularity of the tongue.

The joint was opened by a straight incision on the inner side of the patella. The appearance of the tissues of the joint was striking and totally unlike any I had ever seen. The synovial fringes were found thickened and the ligamenta alaria below the patella were very much hypertrophied. The entire synovium was of a dirty brown or chocolate color. There was no evidence of recent hæmorrhage, but the fringes appeared as if about to undergo sloughing, a condition which is described as characteristic of the hæmophilic joint. The hypertrophied portions were thoroughly excised both on the lateral and on the infrapatellar surfaces. There was but an ordinary amount of bleeding at the time both in the skin incision and within the joint and no ligatures were used though two small vessels were cut in making the opening incision. Six strands of silk worm gut were used for

drainage of the joint and the incision was closed with the same material for sutures. One of the small vessels cut showed a tendency to bleed and was caught with a suture and easily controlled. The leg was placed upon a posterior straight splint and an ice-cap ordered applied continuously.

July 19.—Wound dressed to-day. Considerable oozing but not more than is frequently seen after similar operation. The drainage was removed and there immediately occurred a gush of blood which continued to flow. The lower suture (which had caught a bleeding vessel) was removed and the vessel began to spurt blood. A pressure bandage was applied and an ice-cap kept on constantly. A few hours later, it was found that bleeding was still present and it was necessary to introduce two stitches to control it. Morph. sulph.,  $\frac{1}{8}$  gr., and atroph. sulph.,  $\frac{1}{150}$  gr., were administered hypodermatically several times during the day to control pain and hæmorrhage.

July 20.—Patient had a bad night. Was very restless and complained much of pain in the knee, describing it as a *pressure*. The knee was greatly distended and very painful. It was surrounded by ice-bags and no bleeding was perceptible from without. He had one grain of codein during the night without benefit. Strych. sulph.,  $\frac{1}{30}$  gr., was given every three hours and iron in the form of Basham's mixture was begun. He also received a high enema of whiskey 1 ounce, ammon. carb., 20 grs., and normal salt solution 6 ounces, because of the exhaustion and weakness. Gradual improvement followed and the leg was not dressed until the twenty-fourth. Calcium chloride, 15 grs., every three hours was begun on the twenty-third and continued for three days and on this date his temperature rose to above 101 degrees.

When the dressings were removed on the twenty-fourth, bleeding began immediately. A probe was gently inserted into the lower end of the incision and the hæmorrhage became profuse. Pressure with the bandage controlled it completely and the ice-bags were continued. On the twenty-sixth the stitches were cut but not removed, and even this caused bleeding which could not be controlled by pressure and it became necessary to introduce two sutures. There was severe and constant pain in the knee and extending to the foot. Sleep was impossible without codein or morphin.

On the twenty seventh, he was given by mouth 6 ounces of a 10 per cent solution of gelatin twice daily and on the twenty-eighth the leg and foot were encased in an interrupted plaster splint. Adrenalin solution (1-1000) in 8 minim doses was given every four hours but with no effect upon the hæmorrhage. The influence of the plaster splint was noticeable in the temperature which fell gradually during the following week. The effects of the gelatin upon the clotting of the blood were most marked, the resultant clot forming very rapidly and proving the most firm and elastic that I have ever seen. The escaping blood formed in a clot under the dressings and this could be lifted from its position with ease and handled very freely without breaking. It had much the consistence of gelatin but was slightly more elastic. The gelatin and adrenalin were continued until August 5, and constant oozing was present. The lips of the wound had separated and exposed an unhealthy granulating and bleeding surface. The entire knee was much swollen and the patient's condition was far from encouraging. On this date, thyroid extract in 5 gr doses three times daily was begun. Immediate benefit resulted, the temperature dropping still further and the bleeding lessening. By the eighth, bleeding had entirely ceased, though there remained serous oozing from the necrotic area of the wound. Pain lessened and the patient began to eat. A blood count made on the eleventh showed red cells, 4,310,000, white cells 6,720, hæmoglobin 60 per cent. The records of examinations made previously have been lost, but my personal recollection is that the hæmoglobin was as low as 30 per cent a week after the operation.

From this time on the progress was rather rapid and in two weeks the wound had entirely healed and he was walking about on crutches. Strength quickly returned, color became better and he continued to take the thyroid and that alone. On August 27, while eating dinner he accidentally bit his tongue and free oozing of blood began. Monsel's solution was immediately applied and the bleeding ceased. Repeated hæmorrhages occurred during the ensuing week, but were temporarily checked with Monsel's solution. Aside from this, the patient looked and felt well and had no pain or trouble in the knee. He left the hospital on September 8 seemingly in perfect health. The cast was removed from the knee a few weeks later and he was warned against using



the leg in walking. A small clot or magma was still adherent to the tongue from the action of the Monsel solution, but there was absolutely no bleeding. A short stay at the seashore proved extremely beneficial and he is now following his work as a waiter with perfect comfort to himself. He has not yet regained full use of the joint, though movements to increase flexion have been advised. He is extremely cautious of motion of the part so as not to injure it in any way. Since he was twelve years of age, he has also had slight "rheumatic" pains in his right hip with trifling impairment of function, but as there is no actual disability or interference with his work, nothing has been done for it. The thyroid extract is still continued twice daily and the changed color and appearance furnish the best evidence of its beneficent effects. Two weeks ago, while descending a stairway, he slipped and wrenched the knee, but experienced absolutely no ill-effects from it, which is in marked contrast to the results of a similar injury prior to the time of operation.

An examination of the eye-grounds was made by Dr. C. A. Veasey to determine any possible evidence of change in the vessels of the fundus or the optic nerve. His report is as follows: "Vision, pupillary reactions, fundi, fields and external muscle rotations are normal. No abnormality whatever can be observed in the vessels of the fundi."

The two most widely accredited theories of the location of the cause of hæmophilia are (*a*) that it concerns the coagulability of the blood, and (*b*) that it lies in the tissues of the vessels. Many researches have been instituted to determine if possible which is correct, but failure has attended them thus far. Weil (*La Tribune Médicale*, Jan., 1907) believes that in hereditary hæmophilia there exist incoagulable substances in the blood which may have their origin in various organs, one of which is the liver (Delezenne). Sahli (*Zeitschrift f. klin. Med.*, 1904, vol. lvi, Nr. 3 and 4) believes the coagulation of the blood is at fault, but the cause of it lies in the vessel structures themselves, chiefly the endothelial lining. Weil (*loc. cit.*) publishes the effects of the use of normal serum when injected into a "bleeder." He says, "The treatment with injections of fresh serum, efficient though it may be, has no value in the

permanent cure of the affection It does not attack the cause and is but an appropriate symptomatic medication. The dose

should be from ten to twenty cc Human serum or the serum of a horse should be taken as they do not give rise to accidents " This is an admission contrary to what he has endeavored to prove and points very strongly to the tissues as the parts at fault The use of the thyroid extract also adds to this view, as it appears to supply some vital substance to the tissues which is lacking either totally or in part in these cases.

In the case just detailed, the marked change in the appearance of the wound, the healthy color of the granulations, etc., is in thorough accord with the observed action of the thyroid in other conditions We are forced to admit, however, our ignorance of its mode of action, and until this is known all theories must remain as such though it is thoroughly justifiable to venture the opinion that the blood is at fault in some instances and the tissues in others while in still others both are affected

# STAB WOUNDS OF THE HEART.\*

WITH REPORT OF A CASE.

BY RICHARD H. HARTE, M.D.,

OF PHILADELPHIA,

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It has been the general impression on the part of the world at large that all wounds of the heart, no matter how trifling, so long as the pericardium was injured, the injury must be necessarily fatal. This was the accepted opinion of all of the older surgical writers. Hallerius appears to be the first to differ from this old accepted theory, and to assert that heart wounds were not necessarily fatal. It would seem as though these conclusions might have been arrived at long before, especially when hand-to-hand combat was so common, and, from the very nature of the arms employed, punctured wounds of the heart must have been very frequent. Many non-penetrating wounds of the heart must have recovered, and persons sustaining penetrating wounds must have often lived for some time, and were capable of making considerable exertion. To bear out this statement I recall a case which occurred when I was a resident at the Pennsylvania Hospital, in which a sailor was stabbed on board ship with a sailor's sheath knife (an ordinary butcher knife) which inflicted a penetrating wound from  $1\frac{1}{4}$  to  $1\frac{1}{2}$  inches in length in the left ventricle. The patient lived about two hours, but died shortly after his admission to the ward, apparently from the loss of blood and embarrassment of the heart's action due to a pericardium distended with blood clots.

Wolf, as long ago as 1642, gave the first reliable account of the healing of a heart wound. Later Desoult described the steps of an operation for the relief of pericardial empyema. In 1798 many cases were reported of heart wounds in which pro-

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\* Read before the Philadelphia Academy of Surgery, February 4, 1907.

tracted periods intervened between the receipt of the injury and death Up to the end of the nineteenth century the treatment of heart wounds was purely expectant, consisting of rest, ice, cardiac sedatives blisters etc , etc

In 1881 Dr John B Roberts suggested the propriety of attempting to suture the heart muscle in cases of stab wounds This idea, however, did not meet with much encouragement, as so distinguished a surgeon as Billroth declared that a surgeon who wished to retain the respect of his confreres would not attempt such a procedure

Again, as the result of experimental research much light has been thrown upon the future of heart surgery which may be voiced by the statements of Elsberg quoted by Stewart in his classic paper on this subject

The consensus of opinion among experimenters is that the heart after being exposed can be grasped with the hands or forceps and gently compressed with no appreciable effect on its action, that punctures with needle or knife produce only a temporary irregularity in the heart's action, that wounds produced during systole bleed more than those occurring during diastole, that wounds of the ventricle produced during systole are larger than those produced during diastole that oblique wounds bleed more than perpendicular wounds that wounds of the right ventricle are more dangerous because of the thin ventricular wall and because the blood in the right heart coagulates more slowly that wounds of the heart heal kindly, and that the cicatrix is complete in two weeks, that interrupted sutures are better than continuous ones, that the material enclosed in the grasp of the sutures causes atrophy and is replaced by scar tissue, that superficial stitches are less liable to tear out than deeper ones and that the stitches should be inserted and tied during diastole because of the danger of tearing out during systole

It will be seen that some of these opinions are of practical importance while others are theoretical and impossible to carry into effect

With this much learned as the result of experimental

research, two unsuccessful attempts were made in 1896 at cardiorrhaphy, and a year later Rehn published the report of the first successful operation. Since that time a number of successful cases have been reported, two by Fellows of this Academy, Dr. Stewart and Dr. Gibbon.

The heart may be wounded by all kinds of vulnerating bodies producing punctured, incised, lacerated and gunshot wounds, all of which may be received in a great variety of ways. In a large percentage of cases the pleura will be wounded. In a number of cases carefully analysed by Stewart, it was found that the pleura was wounded. Gibbon, however, was fortunate in his two cases not to have the pleura injured, which is of great advantage, preventing much of the danger from infection.

The symptoms following a penetrating wound of the heart vary greatly under different conditions. There are always varying degrees of shock which depend largely upon the size and character of the wound. If the pleura is opened and the wound is sufficiently large extensive hæmorrhage may take place into the pleural cavity. Or, on the other hand, blood may pour out into the pericardium or externally. Auscultation produces a variety of symptoms, such as a splashing sound, indicating air and blood in the pericardium: sometimes a friction sound will be noticed, and in other instances a bruit, as though an aneurism existed. The heart's action is irregular and often very labored. The pulse may be less than 100. If the blood is confined to the pericardium the præcordial dulness will be greatly increased on percussion. (Upon these facts I based my diagnosis in the case which I here report.) The pulse will be very feeble and the apex-beat can be neither felt nor heard. The pressure manifests itself first on the auricles and the origin of the great veins, causing venous stasis, which may manifest itself by dyspnœa and cyanosis, the ventricles having a tendency to pump themselves dry, and the heart finally ceasing to act. Without surgical intervention the individual will die from anæmia, compression of the heart, or, later, from sepsis or functional incompetence.

From what has been surmised it would appear that the diagnosis of wounds of the heart could be made without much difficulty. But at times a positive diagnosis can only be determined upon by an exploratory operation. For instance, in punctured wounds involving the præcordium where the internal mammary and intercostal arteries are injured a violent hæmorrhage may ensue which may confuse the condition, with that of a penetrating wound of the heart. The size of the wound of entrance is no index to the size of the wound in the heart, which may be greatly increased either owing to the heart's action or to the position and movement of the wounding instrument.

Stewart quotes Fisher who analyzed 452 heart wounds and says that from 7 to 10 per cent of these cases recover spontaneously. This estimate seems high but even if it were positive it should not deter one from prompt surgical intervention if the patient's condition warrants it. The prognosis in these injuries depends upon the kind and extent of the wound inflicted, and last but in no wise least, upon whether or not there is infection, especially of the pleural cavity. Gibbon in an unpublished paper, is disposed to think from an analysis of the reported cases that gunshot wounds of the heart would give a higher recovery rate than stab-wounds if it were not for the injury of other viscera which nearly always accompanies gunshot wounds especially injury to the lung and pleura. There are 19 cases on record where bullets have lodged either in the heart muscle or cavity and in which the patients have lived for varying periods after receipt of the injury. It may be fair to presume that an individual who lives a couple of hours after the receipt of a heart wound has a fair chance to recover with an operation. Many cases which succumb in a short time, would recover if they could have prompt surgical intervention.

In operating on these cases an anæsthetic seems imperative. Except when the patient is unconscious ether is unquestionably the anæsthetic to be preferred. Time is an important factor, and every provision should be made beforehand so that the steps of the operation may go on without any interruption. As

to the incision for the exposure of the heart, this depends in a measure on the exigency of the case. If possible the incision should be so planned as not to involve the pleura. It is questionable, however, if any operative technique will ever be established for dealing satisfactorily with these cases. The formal osteoplastic flap, as employed by the Continental surgeons for exposing the heart, is liable to result in injury to the pleura, and is not to be classed with the simple suprapleural operation where two or more costal cartilages, and if necessary, a portion of the rib, can be divided and reflected back over the sternum. With care the pleura and pericardium are easily separated from the overlapping tissues, giving the operator every facility to open the pericardium without involving the pleura. In my own case I erred by following the course of the wound through the pleura, thus causing immediate collapse of the lung, and forming later a favorable field for infection. After a satisfactory exposure of the pericardium it should be opened with a blunt pair of scissors, after carefully raising the pericardium from the heart with forceps, as the latter will be floated or pushed forward if much hæmorrhage has taken place, into the pericardium. Loose blood and clots should be quickly sponged out, when usually the bleeding spot can be felt or seen, and controlled by pressure until sutures can be introduced.

The best suturing material is chromicized catgut, reasonably fine, introduced on a sharply curved needle. Each stitch should be left long after tying, as the ends materially assist as tractors and enable the more accurate introduction of the subsequent stitches. It will be found in many cases that the heart's action is very rapid and erratic, and that the introduction of the first suture is like attempting to perform the same operation in the back of a fish which has just been taken from the water and is still impaled on the hook. In ventricular wounds the sutures should be inserted deeply, even to entering the endocardium, as only by this means can accurate approximation be procured. In wounds of the auricle through-and-through sutures are imperative, as well as several superficial ones, as bleeding sometimes takes place through the suture wound, as experienced

in my case This, however, can be easily controlled by a few superficial stitches inserted at the bleeding point In introducing the sutures everything should be sacrificed in order to obtain accurate approximation of the wound If the line of suture should involve the coronary artery little harm is likely to result if it is caught in the suture This occurred in Gibbon's case without ill effect. Ricketts also showed in experimental work on the dog that either coronary artery could be tied without harm

In wounds where the lung is also injured considerable bleeding may take place from the lung substance, but when there is an opening of any size in the pleura the lung invariably collapses This in itself may be sufficient to control the bleeding point This, failing, however, several deep sutures may be inserted into the lung substance at the bleeding point and firmly tied The pericardium should be closed with a continuous catgut suture without drainage, as this cavity is much less apt to become infected than the pleura, and it is the best practice to close the pericardium in this way, although it is just the reverse with the pleura If the lung is collapsed, the pleural cavity if possible should be cleansed of all free blood and clots, and if the patient's condition admits, provision should be made for drainage by an opening in a dependent part of the chest No power can prevent infection in a wound where air is drawn into the pleura with each inspiratory act

It will be also noticed that when the heart has lost its natural support by the surrounding lung, owing to its collapsing, it will immediately begin to become more erratic in its action and to race in a most excited manner This can, in a great measure, be overcome by loosely packing the large space with liberal pads of gauze wet with salt solution This was very noticeable in my case, and it seemed as though the heart would almost jump out of the chest until surrounded and supported by the moist packs of gauze.

The after treatment of these cases is simply routine, in which small doses of morphia may be employed to advantage

W W, aged twenty one, colored, longshoreman, was ad-



mitted to the Pennsylvania Hospital on June 9, 1906, with a stab-wound of the left chest, in third interspace to the left of the sternum, inflicted with a long-bladed pocket knife. The wound was about  $\frac{1}{2}$  inch in length. On admission the patient was somewhat shocked but did not complain much of pain. After being placed in bed reaction took place, and when seen by me two hours later the heart's action was fairly good; the pulse was about 120 and could be readily felt at the wrist. On auscultation, however, it could be seen that the heart was laboring very considerably, the sounds being very indistinct and muffled. The præcordial dulness had very much increased and had been gradually doing so since his admission, as noticed by Dr. Drayton, the resident physician, and it was very evident that the knife had entered the pericardium and wounded the heart. Operation was immediately decided upon. The patient was etherized and an incision about 4 inches long made to the left of the sternum, following the line of the wound, which had opened the pleura. The two ends of the fourth and fifth costal cartilages were removed from their attachment to the sternum, which, with the aid of a retractor, freely exposed the pericardium. It was noticed that the lung was partially collapsed, and the heart was laboring very much within the exposed pericardium. The pericardium was freely incised and found full of clot, which was rapidly removed and a wound about  $\frac{1}{2}$  inch in length found in the left auricle, from which a stream of blood squirted to a height of about 9 inches. The heart's action on the removal of the clot became fearfully rapid, and it was with the greatest difficulty that a number of sutures were introduced into the auricle, which was finally closed with chromicized gut. It was rather curious to note that immediately on the introduction of the first stitch the size of the blood stream from the auricle was reduced, but in place of one stream there were four, two small ones coming from the needle wounds. Two stitches were introduced through and through the auricle and these had to be fortified by a number of superficial stitches. In a few minutes all bleeding was permanently controlled. After thorough cleansing of the pericardium it was sutured. Apparently owing to the lack of support which the heart did not receive from the collapsed lung, its action was very violent and erratic. Two large section pads were placed behind the pericardium saturated with normal salt solution, and

the heart and respiration immediately became more normal. One pad was placed on top of the pericardium and brought out through the incision. The lower end of the incision was approximated with silk-worm gut. The patient reacted well from the operation. Subsequent to operation his pulse was of rapid but fair quality, about 120 to 140, and respirations ranged from 56 to 72.

The third day after operation the pads were removed and the patient's general condition was good. The following day the superficial drain was removed and another inserted, the left chest was strapped, which materially assisted the breathing. It was very evident that infection had taken place in the chest, as the discharge became very profuse and foul. On June 29 a rib was resected and a drainage tube inserted in the posterior axillary line. For some reason this did not drain satisfactorily. On July 3 another incision was made and the seventh and eighth ribs were resected in the postscapular line, and a tube inserted, but this did not in any way relieve the condition and shortly after the removal of these two ribs the patient died.

The autopsy showed an empyema of the left chest, which drained badly. The left lung had collapsed, and was the seat of a bronchial pneumonia. The right chest contained 11 ounces of bloody fluid, and there was also a bronchial pneumonia of this side. There were extensive pericardial adhesions with no sign whatever of the stab-wound. The endocardium and valves were healthy.

## HERNIA OF STOMACH THROUGH THE DIAPHRAGM INTO THE THORAX.

BY G. S. GORDON, M.D.,

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THE following case is reported as a contribution to the literature of diaphragmatic hernia :

The patient, a man thirty-one years of age, nothing notable in his family history, was well until six years ago when he was stabbed in the left flank. He is a horseshoer by trade. He weighed at onset of illness 175 pounds, and used tobacco to excess.

His present illness dates back four years ; and the symptoms have been about the same since, varying only in degree of severity. His sister says he always had " a weak stomach." Knife-like pain over short ribs of left side extending to left shoulder tip and occasionally down left arm ; was relieved by a fakir some months ago by well rubbing in some secret remedy. This pain was worse when stooping over shoeing horses, and with it was associated a bloating of the epigastrium and distress in the epigastric region. All symptoms improved on vomiting an acrid sour material five minutes to one hour after eating. Vomitus never contained blood or was of coffee-ground appearance. Condition is worse now, but on some days he is quite free of vomiting. He once discontinued the use of tobacco for a month, with some benefit. He lies easier on the left side. Has always been constipated. Tachycardia is troublesome at times.

*Present Condition.*—A walking skeleton ; weight about 90 pounds ; skin dry and harsh ; abdomen scaphoid and easily palpated without tenderness throughout. An under-exposed skiagraph after a dose of bismuth showed a largely dilated stomach and the œsophagus ; but little reliance was placed on the interpretation of this. He eats mostly solids, and sometimes retains shredded wheat biscuit and bacon while liquid foods are immediately returned. Test vomitus was unsatisfactory for examination, as food was (on occasions when specimens were saved) returned almost as soon as swallowed. Obstinate constipation. Lungs and heart normal. Temperature slightly subnormal.

*Operation*—The duodenum was identified about in mid line of abdomen, but no stomach in sight. It was brought down by traction through the œsophageal opening in the diaphragm, which was large enough to admit three fingers to the second joint. The stomach was hugely dilated and of hour glass form. Gastro-enterostomy (Mayo's) was done attaching the proximal end of the hour glass to the jejunum with the hope that reduction of the hernia and gastrojejunostomy would keep the stomach in place. The cicatrix of the old stab wound intraperitoneally showed nothing bearing on the condition.

*Post Operative Course*—The first twenty four hours were uneventful except that slow salines per rectum were not retained. Late the second day beer was rejected by mouth and thereafter only occasionally was liquid nourishment retained and later not even hot water was tolerated. Salines were given subcutaneously. *He sank rather suddenly on the fourth day. When preparations for a jejunostomy were complete he was moribund.* The temperature had remained subnormal throughout and not till the night of the third day did the pulse flag or run above 72. No blood was passed by rectum or mouth.

*Post mortem autopsy* revealed the stomach in part returned through the diaphragmatic opening into the thorax. On slitting the diaphragm the stomach was found lying free in the pleural cavity with the left lung. Operative wounds looked well. The hour-glass constriction was a narrow fibrous band most marked on the epiploic border and was probably the junction at one time of the thoracic and abdominal sections of the stomach. Four years ago it would seem as though the whole stomach had become a thoracic organ. It would seem that the diaphragm was so depressed that the stomach was very nearly at its normal level, and plenty of room was thus left for the expansion of the left lung. Treves states diagnosis of diaphragmatic hernia is easily made. Several skilful diagnosticians were misled in this case. No literature at my disposal deals with the surgical treatment of these cases.

Had time permitted, the stomach might have been stitched to abdominal walls. Stitching of the stretched œsophagus to the œsophageal opening in the diaphragm hardly seemed feasible (even post mortem), owing to the high level to which it retreated when the stomach was brought down. Jejunostomy alone might have been done, and, later, when the patient was fed up other operative measures taken with better chance of success.

# NOTE ON CARCINOMA OF THE CARDIAC END OF THE STOMACH.

BY GUTHRIE M'CONNELL, M.D.,

OF ST. LOUIS, MO.,

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AFTER looking over the cases reported in the past ten years it seemed that primary carcinoma of the cardiac end of the stomach was comparatively rare. On that account and also from the interesting relationship of the physical conditions to operative procedures, the following case is reported rather fully. I am indebted to Dr. Harvey G. Mudd for permission to present the case, as it was a patient under his charge:

J. E. C., male, white, 50 years old, American. No history of cancer in the family; history otherwise good. Has never had any illness, always strong and healthy. In September, 1905, the patient noticed that there was a burning sensation in the epigastrium after eating and after drinking hot fluids. In October he noticed that if he ate certain things he would vomit them. Was obliged to live on soft foods, as they were not accompanied by pain. In December he observed that after eating he had a throbbing pain in the epigastrium. At this time he was vomiting at intervals but never brought up blood or "coffee grounds." In May he vomited a piece of red flesh-like material with something that resembled skin covering its surface. On June 17 he vomited another similar piece. The first time that the patient noticed any difficulty in swallowing was in December, 1905. Since then he has been growing progressively worse and has been compelled to live on liquid food. In the past six months he has lost about fifty pounds

Physical examination shows a thin, somewhat emaciated man. Skin is rather pigmented. Abdomen is very scaphoid. No tumor can be felt on palpation. Percussion note over the abdomen is rather flat on account of there being little or nothing

in the intestines Stomach does not seem enlarged nor is any mass apparent

On June 19 1906 the man was operated upon and a gastric fistula was made Liquid food was administered by means of a rubber tube but little was retained as it escaped both through and around the tube

On account of the inability to retain food he became gradually weaker until July 14 when he died

A very limited post mortem was made some eight hours after death The body was that of a much emaciated adult white male Abdomen scaphoid In the left nipple line just below the margin of the ribs was an open incision about an inch and a half long On opening the abdomen the stomach was found to be very small and displaced so greatly to the left side that the pylorus was to the left of the mid line The edges of the opening into the stomach were firmly adherent to the edges of the abdominal incision It was seen that the opening made during the operation was not much more than an inch from the pylorus The stomach was also found to be so tightly bound down by adhesions at the cardiac end to the diaphragm that it could not be dragged to the right side

Palpation showed the presence of a dense mass at the cardiac end of the stomach extending into the œsophagus for a couple of inches The stomach about an inch and a half of the œsophagus and a small portion of the duodenum were removed On opening the stomach a tumor mass was seen at the cardia Its surface was very irregular generally pale in color but interspersed with numerous minute areas varying in color from bright red to dark brown The œsophagus was larger than normal and so filled with new growth that it was difficult to get a 0.5 cm glass rod through into the stomach Above the tumor the œsophagus was markedly dilated and filled with a large amount of brownish and extremely offensive fluid

The dimensions of the stomach were as follows Distance from œsophagus to pylorus 11 cm greatest diameter 18 cm, width of the growth at the cardia 5 cm circumference 9 cm, and diameter of œsophagus 3.5 x 4 cm

The microscopic report was as follows The amount of connective tissue in the specimen is comparatively slight existing merely as narrow branching bands separating the epithelial

elements. This tissue is everywhere greatly infiltrated by cells containing small round deep-staining nuclei. Throughout the specimen are nests of varying sizes and shapes composed of cells containing rather long and narrow nuclei that stain quite deeply with the hæmatoxylin. The amount of protoplasm is small and stains faintly with eosin. Besides the nests of cells there are found well marked acini, the openings of which vary greatly in size and shape. Surrounding these openings are cells that appear distinctly columnar in character. The nuclei are long and narrow and are situated at the basal end of the cell. These cells are, however, not restrained by a basement membrane, and in many places can be seen penetrating the surrounding tissues. There is also little regularity in the arrangement of the cells; they differ considerably in size, and in many places are two or three layers thick along the edge of the acini. The larger acini contain masses of granular matter, leukocytes, red blood corpuscles and cells that appear to have desquamated from the lining epithelium.

Diagnosis was malignant adenoma.

The post-mortem findings explained the reason for the leakage of fluid from the stomach after the operation. The incision had been made in the left nipple line, hoping that it would enter the stomach at a sufficient distance from the pylorus to allow of the retention of fluid. As is usually the case in cancer of the cardia the stomach was much diminished in size, and on account of dense adhesions was markedly displaced to the left. In consequence of these conditions the opening into the stomach was located about an inch from the pylorus.

The size of the stomach depends upon the permeability of the opening of the œsophagus, and as in this case there was almost complete obstruction the reduction in size would naturally be extreme.

A clinical diagnosis as to the location of the primary growth, whether descending from the œsophagus or ascending from the stomach, cannot often be made. In this case the microscopic findings show that the tumor is of a type essentially belonging to the region of true glandular epithelium.

According to the statistics of the Middlesex Hospital<sup>1</sup> there were in fifty years (1854-1904) 227 cases of carcinoma of the stomach, in 19 of which the growth was located at the cardiac end. Of these 13 were in males and 6 in females. Two of the cases showed extension for a short distance into the œsophagus. The average ages were 38 in females, 49 in males.

Osler and McCrae<sup>2</sup> in a series of 150 consecutive cases of carcinoma of the stomach, mention two in which there was involvement of the cardia with extension into the œsophagus. One of these had, however, evidently originated elsewhere in the stomach than at the cardia, and had merely involved it in the extension of the growth. Both cases were males 61 years old. Habershon<sup>3</sup> found that in 79 cases of gastric carcinoma examined at Guy's Hospital there were 10 in which the cardia alone was involved. Perry and Shaw,<sup>4</sup> in a series of 46 cases, found 4 of the cardia.

Anders<sup>5</sup> reports a case in a white man 54 years' old. There was a history of five months' duration in which time the patient suffered from nausea after meals and then vomiting of undigested food. Operation revealed a carcinoma of the cardia with a moderate degree of stenosis. There was also some involvement of the lesser curvature and a small part of the anterior wall. Secondary nodules were present in the right lobe of the liver.

Martin and Roberston<sup>6</sup> published the following case. Patient was 50 years' old, weak and emaciated, abdomen was retracted, there were nodules on liver. Ingestion of solids was impossible. At autopsy there was found a diffuse carcinomatous infiltration of the cardia and lower end of the œsophagus. Secondary nodules were found in the liver, omentum, the capsules of the kidney, adrenals, pancreas, diaphragm and the renal and peri bronchial nodes. The microscopic diagnosis was malignant adenoma (cylindrical celled carcinoma).

McCaskey's<sup>7</sup> case was a white male 40 years' old. The trouble lasted one year, death took place at the end of seventeen months. The patient had had pain after eating and although at first there was loss of weight, this was followed by an increase. The blood examination on two occasions showed 6,000,000 red cells, 15,000 white, and 5,500,000 red, 10,000 whites, 110 per cent hæmaglobin. Autopsy showed that the "stomach was not greatly enlarged, the capacity was about 1,200 c.c." Both pyloric and cardiac ends were involved, while the intervening portion was free. Microscopic diagnosis was adenocarcinoma.

The following are the notes on a case reported by Limard<sup>8</sup>. The



patient, a man 45 years' old, had been healthy until about six years before presenting himself for treatment. His disease was first manifested by pain and burning in the stomach which took the form of attacks lasting from four to six weeks. These attacks were followed by periods of some months of freedom from pain. The pain finally became continuous. The stools were frequently black; deglutition became difficult and at last only liquids could be swallowed. The patient was operated upon, with recovery. At the time of the operation the case was diagnosed as cancer of the cardiac orifice extending into the lesser curvature.

Fawcett<sup>9</sup> showed a case in which the cardiac opening was occluded and the walls of the stomach, including the mucosa and the sub-mucosa, were involved. The lower four inches of the œsophagus was dilated. Diagnosis was adenoma malignum.

In those cases in which a microscopic diagnosis was made the tumor was of the type of adenocarcinoma. According to the figures obtained by Kappers and von Roojen<sup>10</sup> from the examination of 106 cases of carcinoma of the stomach the above variety formed 39.2 per cent.

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# A CRITICAL REVIEW OF A RECENT SERIES OF OPERATIONS UPON THE STOMACH\*

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IN a paper read before the Hartford Medical Society one year ago, entitled "The Surgical Treatment of Chronic Dyspepsia," the writer reviewed the subject of gastric surgery, spoke of the evolution of our modern methods and technic, quoted the most recent statistics from many of the best European and American clinics, and among other conclusions stated that the "indications for treatment in benign lesions of the stomach are

"First, Intelligent medical treatment in all primary cases of simple round ulcer. If unrelieved after six weeks of this treatment, operation should be advised

"Second, Operation in all cases of indurated chronic ulcer, and in all cases of recurrent symptoms after a primary cure

"Third, Operation in all cases of pyloric stenosis, excepting those due to gummatous infiltration"

Undoubtedly the most brilliant results have been obtained in cases of chronic indurated ulcer and benign stenosis of the pylorus, and these contrast so strikingly with the almost universal failures which followed the dietetic and medical treatment of these conditions, that to day the great majority of intelligent medical practitioners advise operation in those suffering from these lesions

The honest enthusiasm which naturally follows great achievements in a new field of surgical endeavor, almost always results in the pendulum swinging too far, and the application of surgical therapeutics to unsuitable cases, or to those in which the diagnosis is not accurately established

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\*Read before the New York Surgical Society, January 23 1907

I myself must plead guilty to some of these therapeutic transgressions, and it is my purpose this evening to report a recent series of operations upon the stomach for presumably benign lesions, in which several errors in judgment are to be recorded. It is my hope that by a candid analysis of these cases, and by suggestions which I may glean from your discussion, I shall be able to avoid these errors in the future.

During the past twelve months the writer has performed 16 operations for symptoms thought to be due to chronic gastric ulcer or benign pyloric stenosis. One other case will be included in this series, which occurred in the writer's service but was operated upon by another surgeon, making 17 in all.

In reviewing the histories of these cases I have been struck with the fact of a rather large percentage of failures to relieve the symptoms from which the patient sought relief—much larger, in fact, than in any previous year. Whether these failures have been due to faulty technic, to bad judgment in the selection of cases, or to errors in diagnosis, I will leave for my hearers to decide.

For convenience I shall divide the cases into two groups, those in which a definite anatomical lesion was demonstrated, and those in which no lesion was found. In the first group there are 12 cases, of which 11 recovered and were immediately relieved of their symptoms, and 1 died on the sixth day from pneumonia. Of the 11 which were immediately relieved of their symptoms, 9 are known to have remained well, 1 died six months later, probably of malignant disease, and 1 other continues to suffer and has lost weight. Of the 5 cases in which no lesion was found at operation, 1 was immediately relieved of an hysterical pseudo-tetany, 1 died from persistent vomiting, 1 continued to suffer from the gastric crises of locomotor ataxia, and 2 from symptoms which could only be classified as a gastric neurosis.

Of the twelve patients in Group I:

CASE I.—Was that of an unmarried woman forty-three years of age, referred by Dr. Robert C. Kemp. Two years before admis-

sion she suffered from epigastric pain after taking food, acid eructations, sour vomiting, with rapid loss of flesh and strength. An ulcer cure, consisting of rest, rectal feeding, careful regulation of the diet and appropriate medication, resulted in a complete relief of symptoms for more than a year. The symptoms, however, finally recurred with great severity, extreme agonizing pain, persistent vomiting and a loss of over fifty pounds in weight. The diagnosis of open gastric ulcer was confirmed by repeated gastric analyses. Gastro-enterostomy, short-loop suture method, was followed by immediate relief. Patient gained rapidly in weight (16 pounds in one week) and has since been able to digest without pain or discomfort all kinds of solid food. Total gain in weight in one year, 104 pounds.

CASE II—Was that of an unmarried female fifty years of age. Painful digestion, sour stomach and occasional vomiting for three years. Six months before admission the vomiting became more frequent and often contained food taken several days before. Rapid loss of flesh and strength. Exploratory operation in a neighboring city, diagnosis, pyloric cancer, abdomen closed. She continued to vomit everything taken into the stomach, became extremely emaciated, weak and anæmic. Gastric analysis showed only evidences of dilatation and stasis. At operation, a large inflammatory induration around pylorus was found. Gastro-enterostomy, short loop suture method. No reaction following operation. Liquid food on second day, solid food at the end of ten days, with no pain or discomfort. A recent communication states that she has gained 40 pounds and is in perfect health.

CASE III—A man forty nine years of age. Dyspepsia ten years ago, lasting one year. Symptoms of open ulcer three years ago, with a gradually developing pyloric stenosis. Has suffered extreme pain at times, and has gradually eliminated all solid food from his diet. For past four months has subsisted only on milk. Of late the vomiting has been daily and often copious. A meal of scraped meat and bread caused agonizing pain for five or six hours. Gastric analysis suggested stasis and open ulcer. Loss of 40 pounds in weight. Gastro-enterostomy. Complete relief of symptoms. In three weeks the patient was able to eat solid food, including meat, fish, bread, vegetables, tea, coffee, etc. Later report states that he is now perfectly well—has gained 10 pounds.

CASE IV.—Male, twenty-four years of age. Dyspepsia for six months. Symptoms consisted of epigastric pain and burning after taking food, occasional sour vomiting and acid eructations. Loss of 25 pounds in weight. Gastric analysis indicated high acidity. No stenosis. Gastro-enterostomy, followed by immediate relief of symptoms. Later report: Health good; digestion perfect; gain of 25 pounds in weight.

CASE V.—Female, thirty-five years of age. Duration of symptoms three years. Pain after eating, marked burning sensation and tenderness at epigastrium, some vomiting, loss of weight, hæmatemesis. Gastric analysis showed moderate hyperchlorhydria. Gastro-enterostomy; indurated pyloric ulcer found. Prompt operative recovery, marked improvement in symptoms. A later report, however, shows that the symptoms have returned and that the patient is losing ground. Physical examination reveals a large, hard epigastric tumor. Patient advised to re-enter hospital for observation.\*

CASE VI.—Male, twenty-eight years of age. Hard drinker. Three years ago symptoms of alcoholic gastritis, morning vomiting, etc. Later, symptoms of open ulcer, pain, some vomiting and heartburn. For past six months symptoms of pyloric stenosis, frequent vomiting of food taken day or days before. Gastric analysis showed stasis and fermentation. Loss of weight and strength. On operation, pylorus found angulated and closely adherent to liver by dense adhesions. When these were divided the stomach dropped into place and the pylorus seemed normal in size. Immediate relief of vomiting. Patient discharged on eighteenth day able to eat solid food with comfort. Later report: Gain of 25 pounds; digestion perfect.

CASE VII.—Male, fifty years of age. Dyspepsia for six years. At first pain, sour stomach, heartburn and occasional vomiting with relief of pain. For past year vomiting more frequent, rapid loss of weight and strength. Gastric analysis showed marked hyperchlorhydria. On operation, pylorus found indurated and adherent to pancreas. Gastro-enterostomy, with immediate relief of symptoms. Later report: Excellent health; gained 25 pounds.

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\* This patient entered hospital and was observed for several days—gastric analysis shows complete absence of hydrochloric acid after a test meal. Is now undergoing treatment by tripsin. Diagnosis, carcinoma.

CASE VIII—Male twenty seven years of age Seven years ago severe dyspepsia lasting one year Then a period of four years elapsed without symptoms Two years ago a return of dyspeptic symptoms with epigastric pain and tenderness Ten months ago severe hæmatemesis Treated in medical division of Roosevelt Hospital with marked relief Five months later a second hæmatemesis less severe This was followed by a return of his digestive symptoms chiefly pain Gastric analysis showed high percentage of free hydrochloric acid On operation stomach so bound down by adhesions that suture operation could not be performed Posterior gastro enterostomy by Murphy button Complete relief of pain Discharged in twenty two days eating solid food without discomfort Later report Patient is working every day has had no vomiting or hæmorrhage still has pain after solid food

CASE IX—Female forty three years of age Duration of symptoms only a few weeks Complained of severe epigastric pain with fever and vomiting Later pain became less severe but vomiting continued Treated in medical division of hospital for several weeks Vomiting continued Referred to surgical division for exploratory operation On opening abdomen large inflammatory induration of first portion of duodenum found Gastro-enterostomy immediate relief of pain and vomiting Was later able to take and retain all kinds of food Left hospital on nineteenth day after operation Later report Health excellent no pain or vomiting since operation

CASE X—Male thirty two years of age Four years ago had sudden severe pain in epigastric region This was followed by severe dyspepsia for two and one-half years The pain was more marked one or two hours after taking food Marked relief when he would starve himself Vomiting of sour material would generally relieve pain On two occasions he has vomited blood and passed black stools From January 1905 until July 1906 was free from symptoms For past four months experienced a return of the pain and vomiting with loss of weight and strength Gastric analysis shows hyperacidity On operation pylorus was thickened and surrounded by dense adhesions Gastro-enterostomy was followed by marked relief Patient left hospital on twentieth day able to eat solid food without discomfort Later report indicates complete return to health

CASE XI.—Male, thirty-seven years of age. History of gastric ulcer confirmed by gastric analysis. Apparently relieved by Leubé ulcer cure. Return of symptoms, for which second cure was recommended. During this treatment patient became gradually weaker and progressively anæmic. At first traces of occult blood in stools, then blood in larger quantities, and finally the entire fæcal discharge would appear dark and at times tarry. No gastric analysis made at this time. Operation revealed large indurated area along lesser curvature, strongly suggesting carcinoma. Gastro-enterostomy. Patient was starved for forty-eight hours and then given water for four or five days, finally broth and solid food. Stools frequently examined, no blood found at any time subsequent to operation. Marked improvement in appearance. Hæmoglobin increased from 45 to 70 per cent. Patient remained in hospital fifty-seven days and was discharged able to take solid food in abundance without any discomfort. A few weeks after leaving the hospital the patient began to lose appetite and strength; later, digestive trouble appeared. A diagnosis of tuberculosis of the stomach was suggested by an eminent specialist. He died six months later of symptoms strongly suggesting malignant disease.

CASE XII.—Woman, forty-five years of age. Three years ago began to have symptoms of open ulcer, pain, some vomiting, belching of gas, etc. The attacks would come on and last for a variable period. For last years the pain has been growing worse and the vomiting more profuse. Loss of 40 pounds in weight. Gastric analysis shows marked hyperchlorhydria. Operation showed old scars near pylorus. Gastro-enterostomy. Hæmatemesis immediately after operation. On fourth day lobar pneumonia developed; death on sixth day.

It will thus be seen that in all cases in Group I a definite anatomical lesion was present, and in each case the operation was clearly indicated. In all of the gastro-enterostomy cases, the posterior no-loop operation was performed, and in ten of the twelve the suture method was followed. In no instance was there any evidence of functional disturbance due to the side-tracking of the duodenum. In no case was there any evidence of sepsis or peritoneal irritation, and none of the cases showed

post-operative shock In the only fatal case of the series a severe hæmorrhage occurred in the stomach immediately after the operation and gave rise to frequent vomiting of fluid blood and clots This, however, soon ceased, and although there was a rise of temperature to 102 degrees the night following the operation, it gradually fell to normal On the fourth day, after the patient had rallied from the hæmorrhage and was taking liquid food, she developed a lobar pneumonia of an extremely toxic type, and died in forty eight hours At no time was there any sign of peritoneal irritation or interference with the functional success of the anastomosis, as she took and retained, during the last three days, liquid food in abundance

At first I was at a loss to account for the hæmorrhage, but after conferring with my house staff, I am inclined to think that in making the anastomosis the site of the jejunal opening was not, as it should be, immediately opposite the mesenteric border where the vessels are small and easily controlled by the lock stitch, but on one side nearer the mesentery, for I distinctly recall that after removal of the clamps, there was considerable oozing from the last line of sutures, which was with considerable difficulty controlled This hæmorrhage undoubtedly weakened the patient, and lowered her normal resistance to the pneumococcus infection

In Case XI the patient that died six months after operation of tuberculosis or cancer, we were unable to arrive at any accurate diagnosis during life Had the patient been in better condition, we would undoubtedly have removed a small portion of the indurated mass for microscopical examination, but as his condition was critical in the extreme from prolonged hæmorrhage, we felt the necessity of avoiding any procedure which would prolong the operation The case illustrates very forcibly the remarkable effect which rapid emptying of the stomach had upon an ulcerative process of unusual virulence.

We now come to the consideration of Group II, in which no definite lesions were found at operation



CASE I was that of a spare, neurotic man, fifty-seven years of age, who had suffered for many years from chronic dyspeptic symptoms. Operated on for gall-stones one and one-half years ago; no relief. Now complains of loss of appetite and sense of weight at epigastrium after taking food, sour eructations, belching of gas and obstinate constipation. He often feels a movable hard lump in epigastric region, which he insists is growing larger. This, however, was not verified by our examination. Gastric analysis after a test meal showed total acidity to be 123, free hydrochloric acid 84. Abdomen opened, no definite lesion found, only a slight thickening at pylorus. Posterior gastro-enterostomy. No reaction. No discomfort until he began to take liquid food. He then began to vomit, at first only the food taken, later the vomiting became frequent of large quantities of dilute gastric juice and mucus, and finally intestinal matter. Pulse and temperature remained normal, abdomen flat, no tenderness or rigidity. About the fourteenth day after operation the patient's condition became so critical that the abdomen was reopened. There was no peritonitis, the anastomosis was perfect, the duodenum was not dilated. Abdomen closed, the vomiting continued until death from exhaustion three or four days later.

CASE II was that of a female thirty-one years of age, who gave a distinct history of ulcer in early life, which was apparently cured. For past three years she suffered from digestive disturbances of various kinds, resulting in frequent attacks of nausea and vomiting with pains in the epigastrium and in the left inguinal regions. Operated upon one and one-half years ago for uterine prolapse. For past two months she has lost weight, had severe pain after eating, belching of gas, and frequent attacks of sour vomiting. Gastric analysis showed on two occasions no free hydrochloric acid after a test meal, once it was 24, and again only 9. There was distinct epigastric tenderness. Loss of weight 15 pounds in eight weeks. The patient had been under a severe mental strain, and was decidedly neurotic.

After two consultations it was decided to make an exploratory operation, as she was evidently losing ground. On opening the abdomen nothing abnormal was found, but the symptoms so strongly suggested ulcer that a gastro-enterostomy was performed. During her convalescence, which was uneventful, she

seemed much more comfortable. While on a limited quantity of liquid food she did not vomit and had little pain. As soon as she left the hospital, however, all the old symptoms returned with even greater intensity. She became depressed, lost weight and strength, and was obliged to limit her diet to a few simple articles of food, and even then she had frequent attacks of prolonged and exhaustive vomiting with pain on the left side, extending from the costal border to the groin. Ten months after leaving the hospital she was readmitted for observation and further treatment, as her symptoms suggested a vicious circle.

During three weeks she was kept in bed and carefully observed. At no time was there any bilious vomiting. She would often reject her food shortly after swallowing it, and at other times would go several days without vomiting. A full meal of solid food would often be retained and digested without discomfort, and again small quantities of broth or farina would be immediately rejected with great quantities of gas and pain. Several test meals were given and expressed at varying intervals. The result of these investigations showed that the stomach emptied itself promptly and that there was no marked hyperchlorhydria. There is apparently a tendency toward gastrosuccorrhea, as on one occasion after a fairly full meal at bed time, nearly a pint of gastric juice and mucus was removed in the early morning, but with no bile or food remnants. The patient has alternating periods of mental elation and depression. It is chiefly during the latter that she vomits and complains of pain. On the whole, she was somewhat benefitted by her stay in the hospital. She was seen in consultation by Dr. James, who, after a careful review of the history, agreed with the writer that the case was probably one of a gastric neurosis which had been made worse rather than better by operation.

CASE III.—A man, forty years of age, complained of severe pain in the epigastric region, with tenderness and frequent vomiting. These symptoms first appeared five months before admission, but were relieved by internal treatment. Later the symptoms recurred with great severity and at one time he vomited a large amount of black coffee grounds material. The pain was increased by taking food and would often be relieved by vomiting. Has lost 10 pounds in weight. Gastric analysis showed nothing abnormal. He was seen by a number of the staff of the hospital.

It was thought by some that a mass was felt in the region of the pylorus. The severity of the symptoms led to an exploratory incision. Nothing abnormal was found, but a posterior gastro-enterostomy was performed. The convalescence from the operation was uneventful, but there was practically no change in the symptoms, which were undoubtedly the gastric crises of a locomotor ataxia.

CASE IV.—An emaciated neurotic female, twenty years of age, was transferred to the surgical division of the Roosevelt Hospital, after the medical department has exhausted every resource at their command in an attempt to check or lessen a prolonged period of persistent vomiting. Three months before admission she began to complain of pain after eating, which was followed by vomiting. The symptoms increased in severity. She was obliged to subsist upon liquid diet. Later, the vomiting would occur as soon as any food was taken. She lost strength and flesh rapidly, was constipated and suffered from constant headache. Gastric analysis showed a slight increase in the amount of free hydrochloric acid. Loss of weight 41 pounds in three months.

Upon opening the abdomen nothing abnormal was found, but a gastro-enterostomy was performed in the hope that the symptoms were due to ulcer, and would be relieved by stomach drainage. The operation was easily and quickly performed and she had no untoward symptoms until the following day, when there occurred a rather copious hæmorrhage from the cutaneous wound. This was repeated two or three days later and very much alarmed the patient. Prior to this last hæmorrhage, there had been very little vomiting, although she had taken water and a little milk. After the hæmorrhage, however, she lost heart, said she would surely die, whined and cried day and night, and made no effort to help herself in any way. She vomited at least three-quarters of the food taken and on several occasions flatly refused nourishment. In spite of all these unfavorable factors she made a satisfactory operative recovery, and gradually began to retain a part of the food taken. Every effort was made by the house staff and nurses to induce her to take nourishing food, but much of it had to be administered by force under protest.

About three weeks after the operation she ceased to vomit regularly and would retain the greater portion of the food. The epigastric pain ceased, she said her stomach gave her no trouble,

but she had a pain which extended from the left side of the occiput to the heart and womb. She was obstinately constipated, and as we were obliged to resort to frequent enemas, there occurred a prolapse of the rectum which added to her distress of mind and more than ever convinced her that she was about to die. At present she presents the picture of an utterly wretched and hopeless hypochondriac, although it is only fair to say that for the present at least, the symptoms for which she was operated upon—pain, vomiting and progressive emaciation—have been relieved. I firmly believe, however, that the case was one of a very grave neurosis, which following the operation has manifested itself by other symptoms.

CASE V—A well nourished man of thirty five years. Four years ago, while serving in the Philippines, he noticed cramps in the legs after standing for a long time in the rain. These cramps were painful, but were relieved by stamping the feet. A day or two later they became worse and it was noticed that the toes would become flexed and rigid. He entered a hospital and was treated for several weeks for convulsions. He was finally discharged and remained well until three weeks before admission to the medical service of Roosevelt Hospital. On admission, he stated that he had been having violent convulsions six or eight times each day. His legs and arms were sore from the severity of the muscular contractions. The convulsions would begin by extension of the feet, flexion at the metatarsophalangeal joints, then flexion of the legs upon the thighs and of the thighs on the body. The arms would be flexed at the elbows, and carried across the chest, the fingers flexed at the metatarsophalangeal joints with the thumbs buried in the palms of the hands. The face would be contorted. He would not lose consciousness. After from one to fifteen minutes of these violent tonic contractions he would suddenly relax with a groan, and rub the affected muscles. During the period of relaxation the toes remained spasmodically flexed, and the slightest pressure over the tendons or muscles would excite a renewal of the attack. Although he had no symptoms of digestive disturbance, examination of the gastric contents on several occasions showed considerable dilatation and diminished mobility. After several weeks of careful observation and treatment during which the convulsions became more frequent and violent, he was transferred to the surgical

division for an exploratory operation, on the theory that the case was one of gastric tetany and that there was some pyloric obstruction, either from spasm, inflammatory induration, a new growth. On operation nothing abnormal was found. The anterior wall of the stomach was opened and two fingers forced through the pylorus to insure its patency.

The convulsions ceased immediately after the operation, and he made a satisfactory convalescence. On getting out of bed, however, he was found to have a more or less complete motor paraplegia. He was unable to walk or even stand, and for several weeks made no effort to get about. On being told that he must either go home or be transferred to Bellevue, he angrily arose and walked out of the hospital. The case was evidently one of grave hysteria, and the improvement due wholly to suggestion.

It will thus be seen that of the five cases which make up Group II, in which no definite anatomical lesion was found at operation, one was a case of locomotor ataxia with gastric crises, one a case of hysterical pseudo-tetany, and the other three can only be classified as examples of a gastric neurosis; and while in two of these cases considerable improvement in the symptoms followed the operation, there is little or no reason to ascribe this improvement to the operative procedures. All must therefore be regarded as failures, at least from a surgical point of view.

Taken as a whole, this series of cases teaches, that if one would obtain the best results in this class of patients, he should limit his operative intervention to cases in which the evidence of a definite anatomical lesion is well nigh conclusive, and I can formulate no better rules for guidance than those laid down in the opening paragraph of this paper.

# THE LESIONS ASSOCIATED WITH GUNSHOT WOUNDS OF THE STOMACH.\*

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FIFTEEN years ago reports of cases of perforating wounds of the abdomen invariably led to a discussion of the advisability of operative interference, and the proper time after the receipt of the injury for such intervention. To-day, no such discussion is in place. In civil practice it has been definitely decided that active surgical interference is imperative, although the experience gained in the Spanish-American, the Boer,<sup>1 2</sup> the Japanese-Chinese, and the Japanese-Russian<sup>3</sup> wars has unmistakably shown the desirability of conservative treatment under the conditions found in military service. Furthermore, the question of when to operate is no longer considered. Immediate laparotomy as soon as the patient can be prepared is, I believe, the rule to-day in the hospitals in America and abroad.

During the last twenty years many reports have appeared of results of the operative treatment of penetrating abdominal wounds. These reports have generally grouped together all penetrating wounds, and the number of cases reported in each series of injuries to any one viscus has not been large. In recent years there has been a tendency to class together cases of injury to each viscus, and to consider separately the mortality and treatment of wounds of liver, stomach, diaphragm, lungs, intestines, kidney or pancreas. Such studies have the great advantage of directing the attention to the peculiarities of the wounds of each organ, and the difficulties likely to be encountered in their treatment. There is, however, the disadvantage, in gunshot wounds at least, that isolated visceral injuries must necessarily be uncommon, and that in the dis

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cussion of the lesion to one viscus, equally or even more important associated injuries to neighboring organs are but little considered. For example, a classification which groups under the title of gunshot wounds of the stomach a case in which the bullet has passed through the diaphragm, the lung, the stomach, the transverse colon, and has remained embedded in the pancreas, is obviously unsatisfactory. The stomach injury is no more accountable for the fatal outcome than the associated lesions to lung, colon and pancreas.

My attention has been called to this feature by three cases of perforating wound of the stomach which I have operated on at the Roosevelt Hospital, the first in the service of Dr. Weir several years ago, the second and third recently in the service of Dr. Blake.

CASE I.—This I refer to only for the purpose of contrast. The wound was not caused by a bullet. A young man was stabbed with a knife in the epigastrium. A few hours after the injury the abdomen was opened; a perforation of the anterior wall of the stomach was closed with sutures, and the patient made an uninterrupted recovery.

The second and third cases, both gunshot wounds, I report in detail.

CASE II.—On December 19, 1906, at six P.M., a Chinaman, twenty-three years old, was brought to the Roosevelt Hospital. He had been shot one hour before. He was preparing, at the time, his evening meal, having taken food last at eleven A.M. The shot was fired at a distance of five yards; the weapon used was a 32-calibre revolver. The patient did not vomit or lose consciousness, but bent double and complained of epigastric pain. On admission, his respirations were 36; pulse, 108; temperature, 99° F.

There was a bullet wound over the sixth intercostal space, 7.5 cm. below the left nipple, a little mesial to the mammary line and 9.5 cm. from the midsternal line. There was no wound of exit. A small roundish mass could be indistinctly felt beneath the skin, 2 cm. to the left of the spinous process of the twelfth dorsal vertebra.

The patient was not in shock, nor did he show signs of severe hæmorrhage. There was tenderness and rigidity over the upper part of the abdomen on the left side.

Operation at eight P M, three hours after receiving the injury. Under ether anæsthesia the abdomen was opened by an incision 15 cm long, over the lateral border of the left rectus. There was a moderate amount of blood in the peritoneal cavity. The stomach, which was retracted beneath the ribs, was drawn down, and a perforation was discovered in the anterior surface high up on the fundus. The hole was round, as if punched out. The lesser sac was opened and the posterior surface explored, no wound was found. On more extended examination a second opening was discovered on the anterior surface behind the first perforation. This hole was irregular in shape, and considerably larger than the first. In the manipulations a small amount of the stomach contents escaped. Both perforations were closed with purse string sutures of silk, and second reinforcing sutures of catgut. The spleen was explored and found uninjured. There was considerable hæmorrhage through the bullet wounds in the diaphragm, apparently coming from the thoracic cavity, and on each respiratory movement air and blood were sucked through these openings. The abdominal cavity was thoroughly irrigated with warm salt solution and the abdominal incision closed without drainage. A second incision was then made over the eighth rib in the axillary line, and one inch of the rib was resected and a tube introduced. Duration of operation, fifty five minutes.

Immediately after operation the temperature was 98° F, pulse, 112, respirations, 32. During the night he vomited several times. The vomitus was copious and dark brown. After this vomiting ceased. He passed flatus by the bowel the following day. The temperature reached 102° F on the second day, and fell to normal on the fifth day.

For the first twenty four hours he was given nothing but water by mouth, after that small quantities of milk were administered at intervals. After the fourth day he was given various Chinese soups made largely of rice. During the first four days there was a free bloody discharge from the thoracic tube, the dressing being soaked with blood. There was no respiratory difficulty. Respirations were 24 on the second day. On the third day the patient coughed up a little dark blood. The stitches were



removed from the abdominal wound on the eighth day. Primary union.

After the fifth day the temperature began to rise; on the eighth day it was 104° F. There was free sero-purulent discharge from the thoracic wound. The temperature reached normal again on the twelfth day; the character of the discharge had become distinctly purulent. There was a second rise of temperature on the sixteenth day and it was evident that the chest wound was not draining properly, the diaphragm coming in contact with the end of the drainage tube. Under ether anæsthesia two inches of the sixth rib in the mid-axillary line were removed. Temperature was normal on the twenty-sixth day.

On the seventeenth day the patient complained of pain at the point of lodgment of the bullet in the back. Under cocaine anæsthesia an incision was made over the mass near the twelfth dorsal vertebra, and a cavity was opened containing about 2 drachms of pus, the bullet and particles of clothing.

The patient is now up and about and rapidly gaining strength, eight weeks after the operation.

CASE III.—On January 14, 1907, at 9.30 A.M., a negro, thirty-eight years old, was admitted to the Roosevelt Hospital. He had been shot one hour before. He refused to tell the circumstances of the shooting; but his clothing was scorched as if he had been wounded at short range. He was in slight shock; his temperature was 98° F.; pulse, 104; respirations, 36. The wound of entrance was in the left axillary line over the ninth rib. There was no wound of exit. There were pain, tenderness and rigidity over the upper abdomen. The urine was slightly blood stained.

Operation at 10.30 A.M., two hours after the injury; under ether anæsthesia the abdomen was opened through an incision corresponding to the outer border of the rectus. The peritoneal cavity was filled with blood. An attempt was made to draw the stomach into the wound, but this could not be accomplished on account of adhesions. During the manipulations there was a gush of dark brown fluid. After long search an opening was found in the greater curvature, at the attachment of the gastro-colic omentum, two inches above the point where its direction changes from vertical to horizontal. It was closed with a purse-string suture. The lesser sac was opened through the gastrocolic omentum, and

an attempt was made to explore the posterior surface of the stomach. No opening could be found. No injury to the spleen nor to the neighboring coils of intestine was discovered. The abdominal cavity was irrigated and a cigarette drain introduced down to the stomach wound. The temperature after the operation was 98° F, pulse, 120, respirations, 36. During the day he grew gradually weaker, his pulse became more rapid, his temperature rose to 104° F. He died at 3 30 A M. evidently from hæmorrhage, sixteen hours after the operation.

At autopsy dense adhesions were found in the neighborhood of the spleen. There were two perforations in the stomach, one firmly closed by suture in the greater curvature, the second about one inch from it, on the posterior surface. There was a large retroperitoneal hæmorrhage, the bullet having passed through the upper pole of the kidney. It was lodged in the muscles of the back. There were signs of beginning peritonitis.

In all these patients the stomach was perforated, but the gravity of the injury in the second and the third cases depended on the complicating visceral lesions.

It has, therefore, seemed to me of interest to study the injuries which are likely to be associated with gunshot wounds of the stomach and to see if any deductions can be drawn as to the influence of these on mortality, and any guide obtained for treatment.

As pointed out by Forgue and Jeanbrau,<sup>4</sup> the stomach is so surrounded by other structures that a gunshot wound of that organ alone is almost impossible. They call attention to the fact that lying, as it does, in the hollow of the diaphragm, which separates it from the left pleura and lung, the pericardium and heart, being partly covered by the liver and resting on the pancreas, kidney and suprarenal and spleen, with the transverse colon and coils of the small intestine below it, there is only one small area in front, where, when moderately distended, it comes in contact with the anterior abdominal wall. They show some admirable diagrams taken from Testut's Anatomy, and reproduced by Moynihan in his book on abdominal operations.

They also show by colored plates the surface areas, anteriorly and posteriorly, of gastric vulnerability. The anterior area lies to the left of the median line; its upper limit corresponds to the dome of the diaphragm, which reaches in the mammary line the fifth rib. The lower limit is a line passing through the junction of the ninth and tenth costal cartilages of each side. The posterior area is oval in shape, with the long axis of the oval slightly inclined toward the vertebral column. It reaches from the eighth rib in the left scapular line, to the level of the spinous process of the second lumbar vertebra. Fully two-thirds of this area of vulnerability falls within the limits of the thorax; that is, a bullet, to reach the stomach, must pass through the chest wall and the diaphragm. The stomach being a movable and dilatable organ, and the various structures in contact with it varying in volume from time to time, it is obvious that this area must be constantly changing. It is only true when the stomach is moderately distended.

They emphasize these points in topographical anatomy to show that it is difficult to wound the stomach without injuring surrounding structures, and point out that in a series of one hundred and twenty-six cases of gunshot wound of this organ thirty-two times only was there no associated injury. This proportion would be even less if they had considered wounds of the pleura and diaphragm as complicating injuries.

They find that the mortality varies with the time of intervention and co-existing injuries, and show from their series a mortality of 42 per cent. in uncomplicated cases and of 68 per cent. in cases complicated by other visceral injuries. Their table includes a number of cases reported from fifteen to twenty years ago.

One would expect a lower mortality in gastric perforation without associated injuries, for the chyme is a bad culture medium for pathogenic organisms, and the contents of the fasting stomach, it is said, are relatively sterile.<sup>5</sup> It would seem that when the operation is performed a few hours after the receipt of the injury most of the patients should recover. Such I believe to be the case in uncomplicated stab wounds of

the stomach The chief danger in these cases would be hæmorrhage, and to less extent peritoneal infections introduced from without

In gunshot wounds of the stomach two elements of danger are added A bullet nearly spent may pass through one wall of the stomach and may bruise the mucosa without again perforating There may be no evidence of this contusion externally, or there may be an area of ecchymosis Such bruised areas may cause immediately a fatal hæmorrhage, or, as in Forgue's interesting case, the hæmorrhage may come on later, after the formation of an actual ulcer His case is a rare example of uncomplicated gunshot wound of the stomach, operated on within one hour of the receipt of the injury and with a fatal outcome No other structure of importance was injured, neither the diaphragm, the pleura nor any viscus The bullet (7 mm) passed through the abdominal wall in the epigastric region The shot was fired at close range, but at the laparotomy which was performed one hour *after the injury only one perforation was found in the anterior wall of the stomach* The perforation was sutured and the abdomen closed The patient did well for two days On the third day he vomited blood several times, his pulse became weak and he died with symptoms of internal hæmorrhage At autopsy the peritoneum was normal and the anterior perforation was found firmly closed The stomach and small intestine were filled with blood On the posterior surface of the stomach there was an area of ecchymosis about 5 cm in diameter At its centre the mucosa had disappeared and the wall was much thinned Histological examination showed lesions analogous to those found in beginning ulcer of the stomach The bullet was found within the stomach

Such cases must be very unusual Fertig,<sup>6</sup> in a recent article on traumatic ulcer of the stomach, does not mention gunshot injuries among the causes of this condition

In a few other instances the bullet has remained in the stomach and has been subsequently vomited or passed by the bowel In still other cases the bullet has not actually pene

trated the stomach cavity, but has torn, in its passage, a hole or gutter in the stomach wall. In most instances, however, there has been a wound of exit as well as a wound of entrance, and the failure to detect, at the time of operation, this second opening constitutes another danger peculiar to bullet wounds of the stomach.

Frisch<sup>7</sup> has reported a case of this kind, followed by recovery, the X-ray showing the bullet in the muscles of the back, and has collected five similar cases, all of which are included in Forgue's series. He has proved experimentally that the wound of exit made by bullets of small calibre may be an irregular H- or V-shaped tear, and that the rent in the serosa is often difficult to detect even on close inspection.

M. Auvray,<sup>8</sup> who has operated on seven patients with perforation of the stomach, in describing three recent cases before the 19th Congress of the French Surgical Association, October, 1906, emphasized especially this difficulty. He advised a large opening in the gastrocolic omentum, and, as it was often insufficient, considered the indications for exploratory gastrotomy.

The failure, however, to suture the bullet hole in the posterior wall of the stomach has not materially influenced the mortality. Still, in two instances, it was followed by a subphrenic abscess, and although the patients recovered, convalescence was much delayed, and there are two instances in Forgue's series where failure to close a second opening on the anterior surface was followed by peritonitis and death.

In a series of twenty-five cases reported since 1903, there is no instance in which this accident caused death. Auvray's, Frisch's, Kroner's, Zawadzki's and Jordan's patients all recovered, and in the other instances death resulted within a few hours from hæmorrhage due to associated visceral injuries.

However fortunate one may be in escaping the consequences, an operation cannot be considered satisfactory which leaves unsutured a gastric perforation. A simple method of testing the integrity of the posterior stomach wall might be carried out in the following manner. As soon as the bullet

wound is found in the anterior wall, a purse string suture of silk is passed about it in the usual way. A rubber tube is then introduced into the perforation, the suture tightened firmly about the tube, and a single knot tied and held by a clamp. If a hole be torn through the gastrocolic omentum, and salt solution introduced through the tube into the stomach, one should be able to appreciate readily whether the solution is escaping into the lesser cavity. If such prove to be the case, then the opening in the omentum may be enlarged by dividing, widely if necessary, the gastrocolic omentum, as suggested by Forgue. If there be no escape it is reasonable to suppose that there is no opening or an opening too small to be likely to cause a dangerous leakage. The tube can then be withdrawn from the anterior opening, the purse string drawn together and tied, and the reinforcing sutures introduced.

This method would have the obvious disadvantage that the stomach contents, should there be a perforation, might be forced into the lesser sac, still further contaminating it. But the advantage of being able to tell with certainty whether there is a second perforation seems to me to outweigh this objection.

Of these two dangers peculiar to bullet wounds of the stomach, the first, hæmorrhage from erosion of the mucosa from a spent bullet, rarely occurs, and the second, the difficulty in finding the wound of exit, seems to be only to a small extent responsible for the fatality of the injury.

The records of cases published fifteen or twenty years ago, in which no operations were performed, show clearly that associated visceral injuries were in most instances the cause of death. As has been previously stated one would expect on anatomical grounds a gunshot wound of the stomach to be almost always accompanied by injuries to adjacent structures, and if one considers wounds of the diaphragm, lung and pleura as complicating injuries, then an isolated injury of the stomach is very uncommon. In examining the cause of death in thirteen cases tabulated by Forgue as treated expectantly and as being without complicating visceral lesions, in one

instance death occurred within a few hours from hæmorrhage, the sixth interspace close to the sternum border having been perforated. There is no note as to whether the hæmorrhage was thoracic or abdominal. In a second case, death occurred at the end of several days; in the autopsy notes it is stated that there was neither hæmorrhage nor peritonitis. In a third, in which the wound was caused by a bullet from a revolver, 7 mm., at close range, the wound of entrance being in the seventh interspace, death occurred in two days. The autopsy showed the left lung retracted and the pleural cavity half full of a putrid, watery material mixed with particles of food. The bullet had perforated the pleura, the diaphragm, the stomach in three places, again the diaphragm, and was found lodged in the body of the eleventh dorsal vertebra. The spleen, heart and pericardium were uninjured. There was no peritonitis. In two instances, death occurred from peritonitis; in another, death occurring four months after the injury, the stomach wound was found firmly cicatrized. So, in this series reported as without complications, in only two cases was the fatal outcome due to gastric injury.

A perusal of the cases reported in the second series, in which are grouped cases with complicating visceral injury, shows that in nearly every instance death was due to the associated injury. In several, in which the patient had lived for a number of days, the wound in the stomach had healed, in one instance death being due to an abscess in the liver. In a second case, reported by Rostowzew,<sup>9</sup> the wound of entrance was in the seventh interspace, between the parasternal and mammary lines. There were no abdominal symptoms. On the fourth day it was necessary to aspirate the chest on account of symptoms of asphyxia; on the sixth day foul-smelling bloody fluid was escaping from the bullet wound; on the eighth day the patient died. The post-mortem examination showed two healed wounds in the stomach and a small blood clot and fibrinous exudate on the neighboring serosa. The bullet had passed through the diaphragm, the stomach, and the lower lobe

of the left lung. Death was due to the thoracic complications, not to the injury to the stomach.

In another instance there were wounds of the kidney, the pancreas and the inferior vena cava. Death had occurred in a quarter of an hour.

A further study of gunshot wounds over the area of gastric vulnerability includes, therefore, an inquiry into the associated visceral injuries. As pointed out above, the greater part of this area lies within the limits of the thorax, therefore in the majority of cases there will be a wound of the thoracic wall and diaphragm, in many cases, of the pleura and lower lobe of the left lung.

Such wounds may cause hæmorrhage in the thoracic cavity, and are usually treated by careful cleansing of the surrounding skin, an occlusive dressing applied to the wound and complete rest. The resulting hæmothorax is treated by aspiration as soon as signs of dangerous compression appear. Such hæmorrhage into the chest may come from the thoracic wall, one of the intercostal arteries being divided, or from the lung itself. When it is from the lung, it is believed that the blood collecting in the rigid thorax helps to check the hæmorrhage by exerting pressure on the pulmonary tissue, and one is cautioned not to aspirate until the wound in the lung is closed, lest the hæmorrhage should again be started.<sup>10</sup> It is also generally assumed that the collapsed lung bleeds less than the expanded lung, or that in a given time less blood actually flows through it than normally and it has even been suggested that the chest should be widely opened, with the idea of checking the hæmorrhage by causing the collapse of the lung. Sauerbruch,<sup>11</sup> however, has proved experimentally that in unilateral pneumothorax more blood flows through the collapsed lung than through the same lung before the pneumothorax was established. He finds that there is a hyperæmia of the collapsed lung.

In whatever manner one may interpret the complex phenomena found in the alteration of normal pulmonary conditions, the production of a pneumothorax does not come into



consideration in the class of injuries under discussion. As soon as the abdomen is opened for the purpose of suturing the stomach, air is sucked through the bullet holes in the diaphragm and the lung collapses, if it has not already done so, and a pneumothorax is established.

In a series of experiments, Noetzel<sup>12</sup> has shown that the pleura under physiological conditions is very resistant to infection. If, however, important physiological relations are altered by the entrance of air into the pleural cavity, then the resistance is greatly reduced. The introduction of infectious material into the pleura, when a pneumothorax was established, was invariably followed by an extensive empyema.

If there be any escape of stomach contents during the manipulations of an operation or if there has been any beforehand, particles may readily be drawn through the wounds of the diaphragm into the thorax, and another element may be added to a hæmopneumothorax. It has been previously stated that the chyme is relatively free from pathogenic microörganisms, and the infection which has been shown to follow in some cases may have been introduced into the pleura by particles of clothing or other material carried in by the bullet, the foreign matter from the stomach simply adding to the conditions favorable to bacterial life.

It would seem, therefore, that in certain cases with a well established hæmopneumothorax, drainage of the chest was desirable.

It might with justice be urged that, after suture of the diaphragmatic wound and closure of the abdomen, the pneumothorax would speedily disappear and that it would be legitimate to wait to see whether a severe infection of the thorax would follow. However, conclusions drawn from thoracic injuries uncomplicated by a wound of the diaphragm are, I believe, misleading, and in the second case reported, when I opened subsequently an abscess in the back containing the bullet and particles of clothing, I was satisfied, in this instance at least, that drainage of the thorax was desirable, and it seemed to me that the resulting empyæma was less extensive and the conva-

lescence shorter than if the thoracic condition had been treated expectantly

Much attention has been devoted in recent years to wounds of the diaphragm, to their treatment, and to the possibility of diaphragmatic hernia<sup>13 14</sup> The impetus to this study has been furnished largely by Italian surgeons, who have unusual opportunities for studying and treating stab wounds, and the majority of cases reported have been stab wounds, not gunshot wounds Among seventy-three cases reported by Suter,<sup>15</sup> five only were gunshot wounds, and of these, one was caused by a charge of shot, in a second case a fractured rib tore the diaphragm, in a third the weapon was a rifle and the injury was inflicted apparently at close range, and in a fourth the ensiform cartilage was hit, tearing the insertions of the diaphragm

It is evident that gunshot wounds of the diaphragm heal, for diaphragmatic hernia is very uncommon notwithstanding the number of thoracic injuries received in battle It is also obvious that an incised wound, if it pass through diaphragm at right angle to the course of its fibres, would gape more than a bullet wound and would be much more likely to be followed by diaphragmatic hernia In the only instance of such injury that I have seen, a large piece of omentum was protruding through the chest

An observation by F König<sup>16</sup> shows the manner of healing in gunshot wounds In this instance the wound of entrance was in the fifth interspace near the mammary line, the wound of exit about an inch to the left of the tenth dorsal vertebra The abdomen was not open The chest was aspirated several times The patient died on the forty-fourth day The autopsy showed that the pericardium, which had been grazed by the bullet, was adherent to the heart and firmly bound by dense adhesions to the diaphragm The bullet had passed through the liver and grazed the stomach, causing a traumatic ulcer There were multiple hepatic abscesses It passed again through the diaphragm, tearing irregularly the muscle fibres, and finally through the pleura and lung The pleural surfaces over the

bullet opening in the diaphragm were firmly united by dense adhesions completely sealing the opening.

There are, however, a few cases reported of hernia following gunshot wounds. Bardenheuer,<sup>17</sup> in 1879, gave the details of an autopsy on a man who had been shot eight years before, and whose death had been caused by a strangulated diaphragmatic hernia through the old bullet wound. Robert<sup>18</sup> reports the case of a man shot in the sixth interspace by a revolver bullet of 7 mm. He recovered. One year later death occurred from an intestinal obstruction. The autopsy showed a hernia through the diaphragm.

There is, therefore, a real danger from bullet wounds of the diaphragm, and such wounds, if accessible, should be sutured.

Injury to the liver has been the most frequent visceral complication, and the wound has usually been of the left lobe. The hæmorrhage has not, as a rule, been profuse; only one fatality can be attributed to it. In a number of cases the liver wound was closed by suture; in two, hæmorrhage was checked by packing; in another, the bullet passed through the gall-bladder, which was excised.

The spleen has been injured a number of times. In a recent article on traumatic lesions of this organ, Noetzel<sup>19</sup> has emphasized the necessity of the removal of the spleen wherever the organ is much damaged, calling attention to the fact that sutures do not hold in the friable splenic substance. This difficulty in suturing the spleen is mentioned in a case reported in Forgue's series. The splenic wound was finally packed and the patient recovered. In another instance the wound in the spleen was unrecognized at the operation undertaken for the gastric perforation. Death resulted on the seventh day. At autopsy a wound was found in the upper pole of the spleen. There was a perforation of the diaphragm and a litre of blood in the left pleural cavity, as well as a wound of the lower lobe of the left lung. In a third case the splenic wound was cauterized, the patient dying in a few hours. In a fourth case the spleen was removed; death occurred two days later. The

spleen was injured in four of the cases in the series I have tabulated. In two, the spleen was removed, in a third a Mikulicz tampon was introduced, in the fourth the injury was slight. All recovered.

The pancreas is reported as injured in eight instances in Forgue's series of eighty-one cases in which an operation had been performed and perforation of the stomach found. In seven instances the patient died. In all these there were other severe complicating lesions. One patient recovered. In this case the wound in the pancreas was packed and drainage introduced. There was an escape of pancreatic juice for several days. Death occurred in most of the fatal cases within twenty-four hours, apparently from hæmorrhage, in one instance not until the eighth day. In this case, at autopsy the entire bullet track, and the pancreas itself, were found gangrenous. There had been but little attempt at repair.

Borchardt<sup>20</sup> has collected fifteen cases of gunshot wounds of the pancreas. Six were taken from the older records, at a time when penetrating abdominal wounds were not operated on, and in every instance death resulted. Of the nine cases operated on, the stomach was perforated in three, they appear in the series already discussed. Suture of the pancreatic wound and the introduction of drainage is the treatment recommended. There were five recoveries and four deaths in this series of cases.

Becker,<sup>21</sup> in reporting an unusual case of isolated gunshot wound of the pancreas, calls especial attention to the introduction of drainage in these cases as a means of avoiding the peculiar fatty or pancreatic necrosis. In his case the bullet grazed the stomach without perforating it and no other viscus was injured. The patient recovered.

The records show that in eight instances the bullet, after passing through the stomach, wounded the upper pole of the kidney, causing usually a large retroperitoneal hæmorrhage. Six of the patients injured in this way died, two recovered. In one case two perforations of the stomach and one of the transverse colon were closed with sutures and a large retro-

peritoneal hæmatoma were noted; but apparently no treatment directed toward the kidney was carried out. There was hæmaturia for several days following the operation. The patient recovered. In two instances the kidney was removed, and in both the outcome was fatal. In Riese's case reported in my series, the twelfth rib was resected and the wound in the kidney packed. The patient recovered. In several instances the wound of the kidney and the retroperitoneal hæmorrhage were only made evident at autopsy.

Perforations of the small intestine and transverse colon are recorded among the complicating visceral injuries in sixteen cases. In one instance there were eleven perforations of the small intestine and two of the colon. In several there was a single perforation. Eight of the patients recovered. In most of the instances with a fatal outcome, there were a number of holes in the intestine.

From this inquiry into the associated lesions of gunshot wound of the stomach, the conclusion may fairly be drawn that the complicating lesions are in most instances of graver importance than the gastric injury, and that to speak of the high mortality of gunshot wounds of the stomach is misleading. In any gunshot wound, it is the sum of the injuries inflicted on the different organs and structures which is responsible for the gravity of the condition.

To-day, when it is the rule to operate immediately, there is little opportunity of making an accurate diagnosis of the organs injured; one cannot wait for vomiting of blood, or even for the onset of rigidity in the abdomen. The situation of the small perforating wound furnishes the only guide. If this is over the area of gastric vulnerability extending on the left side from the level of the fifth rib in the mammary line to a line passing through the extremities of the tenth rib, anteriorly; and from the eighth rib in the scapular line to the level of the spinous process of the second lumbar vertebra, posteriorly, then one may expect a number of important organs and structures to be wounded; and it seems to me of practical advantage to think of the injuries recorded in similar cases.

It is obvious that a shot may enter the body at any angle and without a wound of exit and in the absence of an accurate history one may be unable to determine the course of the bullet. Fortunately, the bullet is often to be felt in the subcutaneous tissue the force of a bullet from a revolver (32 or 38 calibre) the weapon most frequently used being sufficient to drive the bullet through the body as far as the tough and elastic skin of the other side. In any event doubt as to intervention would only arise when the entrance wound was near the upper limit of this region.

In an operation undertaken for a wound in this area it is necessary to think of all the structures likely to be injured and to be prepared not only to suture a wound in the stomach but to treat any of the associated injuries. And a reduction in the fatalities should go hand in hand with the recognition and treatment of these complicating lesions. In the twenty five cases which I have tabulated this is clearly shown. In most of them there were associated injuries of graver significance *than the stomach injury* in two splenectomy was performed in two thoracotomy as well as laparotomy in five the diaphragm was sutured in one the twelfth rib was removed and a wound in the kidney packed in another the gall bladder was excised. There were six deaths and nineteen recoveries or a mortality of less than 25 per cent. Most of the cases were operated on within a few hours of the receipt of the injury the longest interval being eighteen hours. In this instance the patient recovered.

This mortality represents not deaths occurring from gunshot wounds of the stomach but those resulting from injuries inflicted by bullets passing through the area of gastric vulnerability.

It would be interesting to contrast these injuries with gunshot wounds over the area of hepatic vulnerability.

It might be urged that only favorable cases are published. These cases however have been taken in most instances from records of all penetrating gunshot wounds reported in a given period from the hospital services of various surgeons.

# ABSTRACT OF REPORTED CASES OF GUNSHOT WOUNDS OF THE STOMACH SUBJECTED TO OPERATION.

| Number. | Reference.                                                             | Age, Sex, Nationality | Weapon, Distance.             | Interval between Injury and Operation. | Wound of Entrance; Wound of Exit.                                               | Operation.                        | Injury to Stomach.                                                                                                                                            | Associated Injuries.                                                                                                                                                         | Result.   |
|---------|------------------------------------------------------------------------|-----------------------|-------------------------------|----------------------------------------|---------------------------------------------------------------------------------|-----------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------|
| 1       | M. Auray. Assoc. Franç. de Chir., XVI Congrès, '03, p. 341.            | 31; M.                | Revolver; 4 or 5 metres.      | 2 hrs.                                 | Left costal border, probably the sixth interspace. No exit wound.               | Median laparotomy.                | In greater curvature, 3 cm. above point where greater curvature passes from vertical to horizontal. Suture. No wound of exit.                                 | Diaphragm.                                                                                                                                                                   | Recovery. |
| 2       | K. Borsákey. Beiträge z. klin. Chir., B. xiviii, p. 577, 1906.         | 15.                   | Two paces.                    | 18 hrs.                                | Two fingers breadth above navel, to the right of linea alba. No exit wound.     | Median laparotomy.                | In middle of lower border of stomach. Sutured. Second hole on posterior surface not far from cardia. Sutured.                                                 | Bullet found in hilus of spleen. Mikulicz tampon applied to hilus. Removed on tenth day.                                                                                     | Recovery. |
| 3       | O. Brehm. Arch. f. klin. Chir., B. lxxiii, p. 234, 1904. Case XVI.     | 20; F.                | Revolver.                     | 2 hrs.                                 | Left hypochond. No exit wound.                                                  | Median laparotomy.                | In greater curvature. Suture. No wound of exit discovered.                                                                                                    | Gutter in left lobe of liver, 2 cm. long. Sutured.                                                                                                                           | Recovery. |
| 4       | Idem. Case XVII.                                                       | 26; F.                | Revolver.                     | 2½ hrs.                                | Eighth left intercostal space in mammillary line. No exit wound.                | Median and transverse laparotomy. | Perforation anterior surface. Suture. Perforation posterior surface. Suture.                                                                                  | Gutter in left lobe of liver, and in spleen. Severe hemorrhage from splenic artery. Ligated; spleen removed; tampon. Subphrenic abscess.                                     | Recovery. |
| 5       | J. Y. Brown. St. Louis Courier of Med., v. xxxiii, p. 9, 1905. Case I. | 30; M. Italian.       | Revolver; close range.        | 1 hr.                                  | Below left costal border. Exit wound between ninth and tenth rib on right side. | Median laparotomy.                | Two openings near pylorus. Closed by suture.                                                                                                                  | Right lobe of liver near lower border penetrated; packed with gauze. Gall-bladder perforated. Cholecystectomy.                                                               | Recovery. |
| 6       | E. D. Fenner. ANNALS OF SURG., v. xxxv, p. 15, 1902. Case VI.          | 27; M. negro.         | Not stated.                   | Not stated.                            | Tenth rib in left axillary line. No exit wound.                                 | Median laparotomy.                | "Good-sized hole in cardiac extremity." Suture.                                                                                                               | Laceration of under surface of left lobe of liver. Sutured. Large hole in spleen. Splenectomy. Hole in diaphragm. Sutured. Bullet found in folds of the gastrocolic omentum. | Recovery. |
| 7       | O. V. Frisch. Arch. f. klin. Chir., v. lxxiii, p. 656, 1904.           | 25; F.                | Revolver; 7 mm.; three paces. | 3½ hrs.                                | Left mammillary line, 2 fingers' breadth below border of rib. No exit wound.    | Median laparotomy.                | Small opening in anterior surface between cardia and pylorus, and nearer lesser than greater curvature. Suture. Careful search failed to find second opening. | Left lobe of liver perforated by bullet. X-ray subsequently showed bullet in lumbar region.                                                                                  | Recovery. |

|    |                                                                                                      |                 |                                       |               |                                                                                                                              |                                                                       |                                                                                                      |                                                                                                                                                                                                                     |                                               |
|----|------------------------------------------------------------------------------------------------------|-----------------|---------------------------------------|---------------|------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------|------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| 8  | Robert W. Johnson<br>N. Y. Med. Jour-<br>nal, v. ix, p. 588, 1904.                                   | 25<br>mulatto   | Revolver, 38<br>calibre               | 1 hr          | Near median line<br>in epigastrium. No<br>exit wound                                                                         | Laparotomy                                                            | Wound in greater curva-<br>ture 5 cm. in length<br>Sutured                                           | Bullet passed through liver<br>Wound closed with sutures                                                                                                                                                            | Recovery                                      |
| 9  | W. M. Jordan<br>American Med. v.<br>ix, p. 1024, 1905                                                | 21<br>white     | Revolver 38<br>calibre                | 2 hrs         | Between ensiform<br>line and navel<br>exit wound                                                                             | Laparotomy<br>through bullet<br>wound                                 | Perforation near lesser<br>curvature. No wound<br>of exit found                                      | Bullet passed through liver                                                                                                                                                                                         | Recovery                                      |
| 10 | Idem                                                                                                 | Negro           | Not stated                            | 8 hrs         | Left linea semilu-<br>naris, near costal<br>margin                                                                           | Laparotomy,<br>left lateral                                           | Two perforations on an<br>terior surface. Suture                                                     | Subphrenic abscess, followed by<br>empyema                                                                                                                                                                          | Death<br>4 hrs after<br>operation<br>Recovery |
| 11 | M. Kroner Arch.<br>f. klin. Chir., v.<br>lxv, p. 643, 1905<br>Case XII                               | 38              | Revolver,<br>7 mm. close<br>range     | 2 hrs         | Seventh interspace,<br>1 cm. ext to mam-<br>mary line. No<br>exit wound                                                      | Laparotomy,<br>left lateral                                           | At fundus large perfora-<br>tion. Suture. No other<br>opening found                                  |                                                                                                                                                                                                                     |                                               |
| 12 | Idem Case XIII                                                                                       | 19              | Pistol 1½ ft                          | 2 hrs         | Below sixth rib to<br>left of mid line                                                                                       | Laparotomy                                                            | Anterior hole near cardia,<br>posterior hole in similar<br>position. Suture                          | Wound of liver. Sutured<br>Sub<br>phrenic abscess                                                                                                                                                                   | Recovery                                      |
| 13 | Idem Case XVIII                                                                                      | 35              | Revolver<br>close range               | 13 hrs        | Sixth interspace<br>ext to mammary<br>line. Exit wound<br>3 fingers breadth<br>below angle of<br>scapula                     | Laparotomy                                                            | Hole near lesser curva-<br>ture. Sutured. No other<br>opening found                                  | Wound of liver. Sutured<br>Wound of diaphragm. Sutured<br>Death following day. Au-<br>topsy showed second perfora-<br>tion of stomach. No perfora-<br>tion of liver. Also, perforation of<br>pericardium and spleen | Death                                         |
| 14 | W. Martin Case II                                                                                    | 23 M<br>Chinese | Revolver 32<br>calibre five<br>yards  | 3 hrs         | Mesial to mammary<br>line. Sixth inter-<br>space. No wound<br>of exit                                                        | Laparotomy,<br>lateral                                                | Two holes in anterior sur-<br>face. Closed by suture                                                 | Wound of lung. Blood in pleura,<br>thoracotomy and drainage                                                                                                                                                         | Recovery                                      |
| 15 | Idem Case III                                                                                        | 38<br>negro     | Revolver 38<br>calibre<br>close range | 2 hrs         | Left axillary line<br>over eighth rib<br>No exit wound                                                                       | Laparotomy,<br>lateral                                                | Hole in greater curvature<br>Sutured. No other per-<br>foration discovered                           | Left kidney. Death sixteen<br>hours after operation, from<br>retroperitoneal hemorrhage<br>At autopsy second opening<br>found in stomach                                                                            | Death                                         |
| 16 | Riese XXXIII<br>Verhandlungen<br>der Deutschen Ge-<br>sellschaft f. Chir., v.<br>xxxiii, p. 89, 1904 | 29 F            | Revolver<br>7 mm                      | 3 hrs         | Left costal margin<br>parasternal line<br>bullet felt under<br>skin in scapular line<br>between eleventh<br>and twelfth ribs | Median laparo-<br>tomy and<br>over twelfth<br>rib in lumbar<br>region | Entrance wound near<br>cardia. Long search for<br>exit wound. Both su-<br>tured                      | Left lobe of liver. Wound su-<br>tured. Diaphragm sutured<br>Subperitoneal resection of<br>twelfth rib. Wound in kidney<br>5 cm. long, packed. Wound<br>of spleen, slight                                           | Recovery                                      |
| 17 | E. C. Riebel Surg.<br>Gynecology and<br>Obstet., vol. iv<br>p. 202, 1907<br>Case VII                 | Negro           | Revolver<br>close range               | Not<br>stated | Sixth interspace<br>midway between<br>mam and axillary<br>line                                                               | Med an laparo-<br>tomy                                                | Two perforations in fun-<br>dus anterior and pos-<br>terior, a little above level<br>of card. Suture | Diaphragm wounded, unsuc-<br>cessful attempt to suture<br>Death in twelve hours from<br>hemorrhage. Autopsy showed<br>bullet in right lobe of liver<br>Some hemorrhage in left<br>pleura                            | Death                                         |



# ABSTRACT OF REPORTED CASES OF GUNSHOT WOUNDS OF THE STOMACH.—Continued.

| Number. | Reference.                                                                          | Age, Sex, Nation'y | Weapon, Distance.            | Interval between Injury and Opera'n | Wound of Entrance; Wound of Exit.                                                                      | Operation.                                              | Injury to Stomach.                                                                                                   | Associated Injuries.                                                                               | Result.   |
|---------|-------------------------------------------------------------------------------------|--------------------|------------------------------|-------------------------------------|--------------------------------------------------------------------------------------------------------|---------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|-----------|
| 18      | Idem. Case XI.                                                                      | German.            | Revolver; 32 calibre.        | Not stated.                         | Two shots. Upper entr. wound level sixth rib, 2 inches left of spine; lower ent. wound over tenth rib. | Lateral laparotomy.                                     | Two perforations in fundus, opposite cardia. Bullet found in peritoneal cavity. Suture of perforations.              | No other abdominal injury.                                                                         | Recovery. |
| 19      | Idem. Case XV.                                                                      | Negro.             | Revolver; close range.       | Not stated.                         | "Centre of sternum on level with sixth costal cartilage."                                              | Median laparotomy.                                      | Two perforations, anterior and posterior. Sutured.                                                                   | Liver.                                                                                             | Recovery. |
| 20      | Idem. Case XVI.                                                                     | Negro.             | Revolver; 22 calibre.        | Not stated.                         | Two inches to left of median line and two inches above navel.                                          | Laparotomy.                                             | Anterior perforation. Sutured.                                                                                       | No other injury.                                                                                   | Recovery. |
| 21      | Savariaud. Bull. de la Société de Chir. de Paris, v. xxxi, p. 845, 1905.            |                    | Revolver; 9 mm.              | 3 hrs.                              | Between ensiform and left costal margin. No exit wound.                                                | Median laparotomy.                                      | Two perforations in anterior wall, near fundus. None in posterior wall. Suture.                                      | Wound of left lobe of liver.                                                                       | Recovery. |
| 22      | Idem. XIX Congrès de Chir. Paris, 1906, p. 155.                                     | Negress; 16.       | Revolver; close range.       | 5 hrs.                              | Left costal border 5 fingers breadths from median line.                                                | Median laparotomy and transverse through costal border. | Perforation in ant. wall near greater curvature. Perforation in post. surface reached with difficulty. Both sutured. | .....                                                                                              | Recovery. |
| 23      | G. T. Vaughan, Americ. Journal of Med. Science, v. cxxxii, p. 285, 1906.            | 35; negro.         | Not stated.                  | 8 hrs.                              | One inch to right and slightly above ensiform. No exit wound.                                          | Laparotomy through right rectus.                        | Two perforations near pylorus. Sutured.                                                                              | Wound of left lobe of liver and large intestine. Died on operating table, evidently of hemorrhage. | Death.    |
| 24      | A. Zakwadzki. Kronik lekarska, 1902, Nr. 16. Ref. Centrall. f. Chir., 1903, p. 296. | 14.                | Flaubert rifle; close range. | 2 hrs.                              | Ten cm. above navel, left of median line.                                                              | Laparotomy through bullet wound.                        | Perforation in anterior wall. Suture. None in posterior found.                                                       |                                                                                                    | Recovery. |
| 25      | Idem.                                                                               | Soldier.           | Modern rifle; close range.   | 4 hrs.                              | Near mammary line, close to seventh rib, 3 cm. long. Stomach contents escaping from wound.             | Left thoracotomy. Median laparotomy.                    | Wound 4 cm. long in stomach. Sutured.                                                                                | Diaphragm sutured through thoracotomy opening, wound 5 cm.                                         | Death.    |

In conclusion :

1. Perforations of the stomach alone should show a low mortality.
2. Uncomplicated gunshot wounds of the stomach are very uncommon.
3. The associated injuries are usually of graver significance than the gastric injury
4. It is misleading to speak of the mortality following gunshot wounds of the stomach without considering the complicating injuries.
5. The mortality of gunshot wounds over the area of gastric vulnerability has been much reduced during the last five years, being now about 25 per cent

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## DUODENAL FISTULA: ITS TREATMENT BY GASTROJEJUNOSTOMY AND PYLORIC OCCLUSION.\*

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A DUODENAL fistula, unless it is of pin hole size, usually occasions a very rapid death from starvation. The duration of life after the establishment of such a fistula depends upon the size of the opening into the duodenum and upon the readiness with which the duodenal contents are discharged. The writer has lost a patient from a duodenal fistula subsequent to a perforating ulcer, in three days, and no doubt others have had similar experiences.

Numerous mechanical devices have been suggested for the relief of this condition, but all have proved insufficient. The proposal of Elliot (*ANNALS OF SURGERY*, 1905) to overcome the malnutrition resulting from the loss of undigested discharges from high seated intestinal fistulæ, by collecting the discharge from the loop afferent to the fistula and injecting it into the loop efferent to it, is scarcely applicable to duodenal fistulæ, because the duodenum cannot be brought up to the anterior abdominal wall so as to enable us to readily collect the discharges from it and reinject them.

With the view of preventing the rapid deterioration of patients afflicted with duodenal fistulæ the writer proposed (*Central für Chirurgie*, 1903, page 556) that a gastro-enterostomy be established and the pylorus occluded. The proposition made at that time had not been tested in actual practice, but since then he has twice had occasion to carry it out, and wishes now to report on its efficiency in overcoming this other-

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wise fatal lesion, and to suggest some points of practical importance in the technique of its performance.

The first case in which the writer carried out his proposal was a patient in whom a cholecystoduodenostomy had been done by Dr. Gerster for the relief of obstructive jaundice due to compression of the common bile duct by a pancreatic enlargement, possibly of an inflammatory character. The anastomosis between the distended gall-bladder and the anterior surface of the second part of the duodenum had been made with Murphy's button, re-enforced with a few sero-muscular sutures. The patient did well for five days, and the jaundice diminished. On the fifth day there was a profuse discharge of whitish acid material from the opening in the abdominal wall that had been left for drainage, and on examination it was found that this discharge came from the duodenum, alongside of the button. The duodenal wall at this site was necrotic, permitting the button to protrude through it. Within the following twenty-four hours the leakage of duodenal contents was very profuse, and coincidentally therewith the general condition of the patient deteriorated very markedly. An attempt was first made to close the opening in the duodenum by suture after removing the necrotic tissues; the gall-bladder being drained externally by tube. This suture, however, did not hold, owing to the infected condition of the parts, and four days after this operation there was again a profuse leakage of duodenal contents. During these four days the patient's condition improved somewhat, but with the re-establishment of the leakage it rapidly deteriorated again.

I determined, therefore, even though the patient was in a most desperate state, to do a gastrojejunostomy and tie off the pylorus, hoping thereby to sidetrack the chyme into the jejunum and thus enable the patient's nutrition to go on uninterruptedly. An anterior gastro-enterostomy was accordingly very rapidly done, with Murphy's button through an incision along the outer border of the left rectus muscle, while through the original wound, in which the pyloric end of the stomach was lying exposed, a large-sized silk ligature was passed around the pylorus and only drawn tightly enough to approximate the mucous walls of this orifice to one another. The incision at the outer border of the left rectus was closed without drainage, and the primary wound loosely

packed with gauze. The patient bore this operation very nicely. The discharge of chyme from the duodenal fistula ceased at once and coincidentally therewith the general condition improved. Eleven days after this last operation it was noticed that the suture which had been placed around the pylorus was cutting through. It was uncertain whether this was due to the ligature having been applied too tightly, in spite of my care to avoid this, or whether, because of the poorly nourished condition of the parts the mere pressure of the silk ligature was sufficient to cause it to cut through them. To avoid further trouble from this ligature it was loosened and the adjacent walls of the stomach and duodenum inverted over it by two tiers of sero muscular sutures (The importance of applying the pyloric suture with just sufficient tightness to approximate its walls will be alluded to again.)

From the time of the gastro enterostomy and pyloric occlusion there was never any discharge of chyme from the duodenal fistula. For the first ten days thereafter the patient's condition improved markedly, but then it gradually failed and he died of exhaustion seventeen days after the last operation. Autopsy showed the enlargement of the pancreas to be cancerous in character, the gastrojejunal orifice was a wide one and the pyloric opening was effectively occluded by the ligature which surrounded it. The walls of the pylorus were commencing to be cut through by the latter ligature.

It was plain that in this patient the impending death from duodenal leakage was averted by the gastrojejunostomy and pyloric occlusion. The ultimate fatal issue was not due to the complicating duodenal leakage but to cancerous cachexia. In my subsequent review of the details of this case, two points came up for consideration.

(a) Is it necessary in order to divert the chyme from the duodenum into the jejunum to occlude the pylorus, or is it sufficient to simply make a gastrojejunostomy? (b) If it is essential to occlude the pylorus then great care must be exercised in applying the occluding ligature lest it cut through the tissues, for in the case just narrated the ligature though tied only tightly enough to approximate the pyloric walls, nevertheless showed a tendency to cut through these tissues. It is evident that if

this ligature does cut through the pylorus a gastric fistula would result, which in turn would likely prove fatal to the patient.

As regards the first point, viz., is it necessary to occlude the pylorus in addition to making a gastrojejunostomy when we wish to divert the chyme directly into the jejunum?

It is commonly believed that if a gastrojejunal fistula is established at the lowest point of the stomach the contents of the latter viscus will be emptied directly into the jejunum through this anastomotic opening, even when the pyloric opening of the stomach is patent. This is, however, an erroneous belief, as is shown by the experiments of Kelling and as is demonstrated by the observations recorded in a second patient of mine with duodenal fistula. In this latter patient I contented myself with making a gastrojejunostomy, which, however, did not suffice to divert the chyme into the jejunum.

Kelling (*Langen. Archiv fur klin. Chirurgie*, vol. lxx, page 289) established in healthy dogs with normal pylorus an anterior gastrojejunostomy.

Then he made fistulous openings in the duodenum and jejunum respectively, 12 cm. below the pylorus in the former, and a like distance below the gastrojejunal orifice in the latter, In each of these he placed a tube that could be effectually closed by a cork. Three days after this operation he filled the stomach with 250 c.cm. of water tinged with methylene blue or rubin red. Thirty minutes thereafter he recovered 100 c.cm. from the duodenal fistula and only 5 c.cm. from the jejunal fistula; 40 minutes thereafter 135 c.cm. had been recovered from the duodenal fistula and only 6½ c.cm. from the jejunal. After another 15 minutes 6 c.cm. more from the duodenal fistula and only 3½ c.cm. from the jejunal. From a number of experiments of a similar character as the above, but slightly modified in their details, he concludes that in dogs with normal stomach, in which a gastrojejunostomy has been established, the passage for the stomach contents through the pylorus is at least as easy as it is through the gastrojejunal opening. That a similar state of affairs exists in the human subject is demonstrated by the clinical observations of the writer in a case of

duodenal fistula resulting from a ruptured duodenal ulcer In this patient a gastrojejunostomy was done but the pylorus was left unoccluded

Chas A W, a native of England, fifty two years old, and a mechanic by occupation, was seen by the writer with Dr Matthews on February 11, 1906 For two years prior to the present illness he had suffered with attacks of vomiting, not associated with the taking of food On February 1, 1906, the patient was suddenly seized, while at work, with severe abdominal cramps which subsequently localized themselves to the right iliac fossa He vomited at the onset, but had no fever or chills His bowels were constipated With rest in bed and local applications of ice, he improved, and three days later got up Twenty-four hours before I saw him, while he was sitting by the stove, he was again suddenly seized, after a severe sneezing spell, with acute abdominal pain and vomiting The pain was most severe just below the free border of ribs on left side On physical examination, the heart and lungs were normal The abdominal wall was of board like rigidity and did not move with respiration The liver dulness was replaced by dull tympanitic resonance There was dulness in both flanks, which did not, however, shift with change in the patient's position There was an area of dulness in the right hypochondrium which corresponded to an ill defined mass about the size of a teacup saucer His temperature was 100, his pulse 108 Diagnosis Ruptured duodenal ulcer, with encapsulated periduodenal exudate Immediate laparotomy was proceeded with at Mt Sinai Hospital An incision was made over the mass through the right rectus muscle Immediately on incising the peritoneum, fresh adhesions were encountered to the right of the suspensory ligament of the liver and extending downward to the umbilical region The adhesions were carefully separated and the peritoneal surfaces thus exposed at once protected by gauze packings On separating the adhesions toward the liver a large, foul smelling gaseous abscess containing about a pint of creamy pus was entered into and evacuated After the pus was removed a perforation was found on the anterior surface of the first part of the duodenum about the size of a pea, with gangrenous edges, the surrounding peritoneal surfaces of the stomach and duodenum were covered with necrotic fibrin and pus After this



latter was carefully removed, the perforation was closed with three layers of Lembert sutures placed in the vertical axis of the duodenum. The abscess cavity was drained and the abdominal wound closed with layer suture down to the emergence of the drains. The patient reacted well from the operation. The highest temperature and pulse for the following week were 100.6 and 104 respectively.

No drink or food were allowed by mouth for five days, rectal nourishment and saline subcutaneous infusion being used to replace them. On February 18, *i.e.*, seven days after the operation, there was noticed for the first time an escape of gastric contents and bile from the drainage openings. Recognizing at once the fact that we had to deal with a duodenal fistula that, on account of the changed character of its surrounding peritoneal surfaces, could not be closed by suture, and profiting by the sad experiences gained in previous cases of duodenal fistula, in which death from inanition and exhaustion followed after 48-72 hours, I at once proceeded to carry out the suggestion I had made in 1903, *viz.*, gastrojejunostomy with pyloric exclusion. A posterior gastrojejunostomy without a loop by the suture method was accordingly made, but instead of occluding the pylorus, I sewed up again the opening in the duodenum, hoping thereby to avoid all danger from a possible cutting through of the occluding pyloric suture.

The patient bore this operation well, and for two days there was no escape of gastric or duodenal contents. Then the suture line in the duodenum again gave way and there was a renewal of the leakage. It was noticed that after the patient took some milk by mouth there would be, within ten minutes, a discharge of milk from the duodenal fistula, and within fifteen to twenty minutes more, approximately all the milk that had been ingested had escaped from the duodenal opening. The wound in which the fistulous opening lay was so infected that I now hesitated, from fear of infecting the peritoneal cavity, to expose the pylorus sufficiently through it, in order to enable me to pass an occluding ligature around it. I therefore made several further attempts to close the duodenal opening by suture, but each time after twenty-four hours the sutures would cut out and leave the opening as before; and each time the duodenum was open, whatever was taken into the stomach would practically all be discharged through

it within fifteen to thirty minutes after it was ingested. On February 28, 1891, ten days after the gastrojejunostomy, I was compelled by the progressive deterioration of the patient to brave the danger of a peritonitis, and to mobilize the pylorus and surround it by an occluding ligature, using for the latter a broad piece of tape. This was passed around the pylorus snugly enough to effect approximation of its walls, but with no constriction of the parts, and held in place by a silk ligature, the knot of which rested on the tape and not on the pylorus itself thereby avoiding pressure from it upon the pylorus.

Immediately after this operation the patient was given 6 ounces of milk and water. There was no leakage, nor was there any further leakage from the fistula during the next twenty-four hours. The patient's strength, however, was so much exhausted by the intermittent but continued discharge of chyme and duodenal contents that he did not rally from this last operation and succumbed the next day.

Post mortem examination revealed a gastrojejunal orifice patent for 3 fingers, and a ruptured duodenal ulcer.

Here there is a clinical demonstration in the human subject of a widely patent gastrojejunal fistula failing to divert the gastric contents when the pylorus was patent and thus failing to relieve the death from inanition that follows upon a persistent duodenal fistula. Kelling's experiments in dogs and our own clinical observations, thus conclusively prove that when the pylorus is patent a gastrojejunostomy will not divert the chyme from the duodenum into the jejunum. Consequently, when we have to do with a duodenal fistula it is necessary not only to establish a gastrojejunostomy but also to occlude the pylorus.

A few words as to the second point I raised viz., the best method of occluding the pylorus. Kelling proposed to accomplish this by three superimposed layers of sero-muscular sutures placed parallel to the long axis of the pylorus, thus infolding the pylorus, and then to kink the pylorus by suturing this end of the stomach to the first and second portions of the duodenum. However applicable this method may be when we have to do with normal serous coverings of the stomach and

duodenum, it evidently is not applicable when the peritoneal surfaces of these viscera have become brittle and friable and fixed in inflammatory exudate; for the sutures will invariably tear and cut out and leave the parts in their primary condition. In the inflamed and altered condition of the serous surfaces of the pyloric region of the stomach and duodenum we must in order to occlude the pylorus resort to a circular ligature. In the application of this ligature the greatest care must be observed not to constrict the parts, for otherwise this ligature will cut through the pylorus and thus again establish the very condition which we are striving to relieve. There was evidence of such a tendency for the ligature to cut through the pylorus in the first case presented, although I exercised the greatest care in its application. This tendency is all the more pronounced in these cases because of the usual poor vitality of such patients' tissues. In my second case I employed a broad band of tape, which was held in position by a silk ligature, the knot of the latter resting on the tape. This seems to be the best procedure, though my second patient did not live long enough after its application to test its final adequacy and adaptability.

It is pertinent at this point to consider whether in cases of ruptured duodenum that may be followed by a fistulous opening it is advisable to resort to a primary gastrojejunostomy and pyloric occlusion in addition to repairing the opening in the duodenum, or to content ourselves at the first operation with direct repair of the perforated viscus. This question can, in the light of our present experience as to the probable ultimate sufficiency of an intestinal suture, be answered. If the peritoneal surfaces surrounding the perforated part are normal in character and are not brittle or friable or fixed in inflammatory or neoplastic exudate, we have every reason to expect a successful issue to our efforts at repair by suture; but if this healthy yielding condition of the surrounding peritoneal surfaces does not exist it is not likely that the healing by suture will occur, and in such cases it would be wiser, if the patient's condition permits of it, to at once proceed to gastrojejunostomy and pyloric occlusion. Again, if by the suture we constrict the

lumen of the duodenum sufficiently to interfere with the transmission through it of the chyme, it is likewise best to at once proceed to gastrojejunostomy and pyloric occlusion

But if a primary gastrojejunostomy and pyloric occlusion has not been done we should at once perform them, when the suture of the duodenal opening proves itself insufficient, for repeated attempts at repair of the viscus by suture will almost invariably result in failure to effect its closure and this will be followed by the death of the patient

The suggestion may be made that a jejunostomy will accomplish all that pyloric occlusion and gastrojejunostomy will, and that, with much less bother and difficulty. In answer to this proposition, however, it is only necessary to recall the sad experiences with jejunostomy in von Eiselberg's clinic. In this clinic, jejunostomy practised for ulcer of the stomach has been attended by the frightful mortality of 44 per cent. My own experience with the operation in complicated cases of ulcer bears out this unfavorable opinion and I would be loath to employ it when I could accomplish by another operation all that could be done by this one. Why it is that jejunostomy is attended by such unfavorable results is not quite clear, except that gastric digestion is entirely done away with, and that the secretion of pancreatic juice and bile is not maintained at its normal amount when the food is put directly into the jejunum

# ILEOCÆCAL INTUSSUSCEPTION DUE TO MYO-ADENOMA OF THE ILEUM.

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A SCHOOLGIRL, aged sixteen years, who had always enjoyed good health, was seized January 12, 1907, with severe "cramps." The first paroxysms quickly passed away, and she was able to be about although the pains recurred at frequent intervals during the following four days. The pains were more or less general over the whole abdomen. Her bowels had moved regularly. It was not possible to ascertain the character of the stools. The patient did not vomit, nor did she feel nauseated at any time during these four days or complain of having suffered in any other way excepting from "cramps." There had been no chill nor fever.

About 2.30 P.M., January 16, she was seized with "cramps" very much more severe than she had suffered in the last four days, and I was called to see her. She was lying on her back with her right thigh drawn up and was evidently suffering the greatest agony. Occasionally she would turn over and lie flat on her abdomen. She complained of having constant pain over her whole abdomen with acute exacerbations of a colicky character which were also not localized. Her pulse was 86, of good volume and regular. Her temperature by mouth was 96.5 degrees, and by rectum normal.

On inspection the abdominal wall just below and to the right of the umbilicus was seen to protrude slightly and this protrusion or swelling transmitted the pulsation of the abdominal aorta. Palpation revealed a mass about the size of a large orange which extended just a trifle to the left of the median line and not quite to the anterior superior iliac spine. A line drawn from the umbilicus to the superior iliac spine almost bisected the mass, passing a little lower, possibly, than the centre. The swelling was painful on palpation, especially so when pressure was brought to bear over McBurney's point. There was

rigidity of the right rectus. No other portion of the abdomen was rigid or painful on pressure. Percussion showed dullness over the mass, which was completely surrounded even below and to the right by a resonant or tympanitic area. During the examination the patient vomited some whiskey and Jamaica ginger which had been given her by her parents. This was the only time she had vomited. Rectal examination showed the uterus and its appendages to be normal.

The patient was given an eighth of a grain of morphia and sent to the Bethesda Hospital in an ambulance. A high enema was given her, but it had no influence on the size or location of the swelling.

An operation was advised, and, assisted by Dr Percy Shields I made an incision through the border of the right rectus over the centre of the mass. The omentum presented itself in the incision at once and quite a quantity of clear serum escaped from the abdominal cavity. Examination quickly revealed the fact that the appendix was not the cause of the swelling although it was bound down and surrounded by adhesions and was subsequently removed.

The mass was seen to consist of several coils of greatly distended small intestine, which was delivered out of the wound with great difficulty, being apparently bound to the posterior abdominal wall. On this account it was with great difficulty that we were able to determine the nature of the trouble. It proved, on close examination, to be an intussusception of the ileum, which could be traced through the ileocaecal valve into the colon. My finger introduced alongside of the intussusceptum showed no adhesions to be present, but a constriction was felt about an inch within, which apparently prevented a reduction of the invagination. At the suggestion of Dr Shields this was dilated but only after considerable effort, and the intussusceptum was gradually withdrawn from its sheath, a large quantity of clear serum escaping at the same time. The gut for a distance of 14 or 15 inches was involved and was congested to a very dark blue. The peritoneal surface was glistening and intact. Hot towels were applied until the gut became more normal. On examining the invaginated gut a pedunculated tumor could be felt within the intestinal canal. An incision was made into the gut and the tumor, which beyond a doubt was the cause of the invagination was removed after its

pedicle had been transfixed and ligated. It was this tumor which to a large extent rendered the reduction of the intussusception so difficult.

The tumor was about half again as large as a hazel nut. It was attached to the intestinal wall by a pedicle, which for the size of the tumor was comparatively broad. Microscopical examination of the tumor showed it to be a myoadenoma. The adenomatous portion is of the tubular variety and shows in places a slight tendency to cyst formation. The interstitial portion is largely made up of involuntary muscle. Covering the surface of the tumor we find ordinary intestinal villi. The seat of the tumor was in the mucosa.

According to the literature at my disposal, myoadenomas are of rare occurrence and are usually found in the duodenum; in this case it was located in the ileum. This tumor is not to be confounded with multiple polypoid tumors, which are papillomas and are of much commoner occurrence.

The patient made an uninterrupted and uneventful recovery. The skin sutures were removed on the tenth day, the wound having healed by primary union.

## THE SURGICAL TREATMENT OF SPLANCHNOPTOSIS \*

BY BYRON B DAVIS, M D,  
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THE abdominal viscera are kept in their normal position by a nice adjustment of the intra abdominal tension and the various suspending ligaments. If, in the effort of lifting, or anything else that increases the tension, the muscles are not equal to the increased work put upon them and begin to stretch, the mesentery, mesocolon, gastrohepatic omentum, etc., become taut and thus prevent any further pressure against the abdominal muscles, and no harm results. On the contrary, if an unusually heavy meal, or undue loading of the viscera with solids, or liquids, causes dragging on their several ligaments, the natural tonicity of the abdominal muscles prevents the viscera from being displaced too far, and does not allow too great a strain on the suspending ligaments.

As long as this balance between ligaments and abdominal muscles is maintained splachnoptosis is impossible. If for any reason it is interrupted, prolapse of the viscera sooner or later is certain. Relaxation of the abdominal muscles, with consequent decrease of intra-abdominal tension, puts an extra load on the suspensory ligaments. They may bear the increased burden for a time, but if it continues they will become gradually elongated and attenuated, and visceral prolapse is the result.

If the weak place is within and the ligaments are first to lose their tone, the abdominal muscles will almost surely gradually relax, and the same condition, splachnoptosis, results.

In most cases I believe the relaxation of muscles or ligaments is due to a general malnutrition, and it would be hard to determine which was the first to give way. Probably many

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\* Read before the Western Surgical and Gynecological Association, Salt Lake City, Utah August 31, 1906



times the stretching of muscles and ligaments is simultaneous, both due to the bodily tone being below par.

Dr. Harris has shown that the kidney is forced out of its normal position because of narrowing of the lower thorax and upper abdomen. This is probably many times a causative factor in general visceral ptosis. I am inclined to believe that in many of the cases the narrowing about the arch of the ribs is an effect and not a cause. When splanchnoptosis exists the most of the abdominal viscera are below the umbilicus. The tendency to produce a vacuum in the upper abdomen causes sinking in at the epigastric region and gradual recession of the lower ribs.

As soon as the descensus of the viscera is an accomplished fact, a train of disagreeable symptoms is manifest. The digestion is impaired, stomach drainage is slow and imperfect, the gastric walls become stretched, intestinal gas is troublesome and painful and constipation becomes pronounced, a greater or less degree of autotoxæmia is always present, and many nervous manifestations occur. In the hands of too many the case is regarded as neurasthenic, but the nervousness should be recognized as only a symptom. Tenderness over all parts of the abdomen is another of the almost invariable symptoms of splanchnoptosis.

That this chain of symptoms is the natural result of visceral prolapse is clear if one stops to think of all the offices served by the suspending ligaments. The blood supply and enervation of the viscera come through the arteries, veins and nerves contained in their ligaments. If these ligaments are elongated, the result can be easily foretold. The return circulation is impeded, and a passive congestion results with decrease in nutrition of the coats of the viscera and perversion of their function. The nerves being stretched, pain and tenderness ensue.

Another important office of the ligaments is to hold the hollow viscera in the most advantageous position to secure results from peristalsis. A viscus in the physiological act of peristalsis, and not held steady by a normal suspensory liga-

ment, works at such a decided disadvantage that little is accomplished. It struggles, to be sure, but its power is not directed properly and the effect is largely lost.

Another function of normal ligaments is to maintain an easy curve in all portions of the gastro-intestinal canal, and thus expedite the smooth and rapid progress of food and food residue from stomach to anus. When these ligaments become overstretched these easy curves are lost and torsion, valvular constrictions, and angulations add much to the distress of the patient, and greatly interfere with his nutrition.

Whatever the remote cause of the condition a fully developed splanchnoptosis presents two anatomical changes that must be reckoned with, the weakened muscular wall of the abdomen and the stretched and attenuated ligaments. To these must usually be added dilatation, to a greater or less degree, of the stomach and intestines, and increased weight of the solid organs, liver, kidneys, and spleen due to the long continued passive congestion. The tendency is for the trouble to become progressively worse, for the abdominal muscles to become weaker and thinner, the suspensory ligaments longer and more attenuated, the dilatation and enlargement of the viscera more pronounced.

No treatment, medical, mechanical or surgical, will be successful that does not recognize all the disturbing factors. I do not for a moment believe that any case of extreme splanchnoptosis was ever cured by medical or mechanical treatment. The mild cases do not cause much trouble if left to themselves, and if treated intelligently with the idea of aiding digestion by suitable diet, relieving constipation, and strengthening the abdominal muscles by massage the descensus may not increase. The severer cases may be sufficiently mitigated by well known methods to render life bearable. But when the liver drops down three to six inches, the stomach lies below the level of the umbilicus, the mesentery is elongated to double or triple its normal length and the kidneys move about at will, no difference what the treatment, medical or mechanical and no matter how persistently the treatment is carried out, the viscera will

remain outside their natural orbits, although sometimes the condition may be made less distressing.

Nine years ago, when I read my first paper on this subject and reported two cases operated on, the criticism was so harsh that I made up my mind to be extremely conservative in the future, and not to operate on any cases unless all possible effort had first been made by all the known medical and mechanical means to relieve the more serious symptoms, and even then not to operate on anyone unless the condition was so severe that life had become practically no longer bearable. This resolution has been strictly adhered to, but I have seven additional cases to report to-day, not counting a large number of nephropexies which will not be considered now, as the time will be more than filled in considering the methods of correcting the descensus of the liver, stomach, and intestines; I will only say that I have considered the kidney by itself. When a movable kidney unquestionably produces serious disturbance, whether or not associated with a general splanchnoptosis, it is anchored. I have been well satisfied with the method advocated in a paper read before this Association in Chicago in 1901.

The charge against operative intervention in splanchnoptosis is that it does not fully relieve and that the correction of the displacement is not permanent. To the first charge the results in my own cases, as well as in the majority of those reported, will bear comparison with the medical treatment of the same cases. Almost every report shows that all medical measures had been tried and failed before operation was thought of. I am willing for any competent internist to have all the opportunity he desires to relieve the condition by non-surgical means in any case that comes into my hands. If he succeeds, well and good; if he fails, it will be time enough then for operative intervention. I hope I have made it plain that no indiscriminate recommendation for operation in all cases of splanchnoptosis is intended.

And now what have been the results of the operations thus far done for general visceral prolapse? In more than seventy cases whose reports I have read, done by all methods, practi-

cally all have been improved. The majority have been so much benefited as to have considered themselves cured, and a good percentage have been reported as wholly cured. In the very nature of the trouble it would be too much to expect that the results would be brilliant. These unfortunate patients cannot be made over. Their tissues are of too poor quality. All that it is reasonable to demand is that these chronic invalids, better dead than alive in their present condition, be so improved that they can again enjoy life, even if denied the vigor of their more fortunate fellows who have never been so afflicted.

There should be a sharp line drawn between true general splanchnoptosis, such as I have endeavored to describe, and those cases where the viscera have been drawn out of position by adhesions. The latter are not regarded in the same category as the former and usually relief of the adhesions would cure without any suspending operation. Only two of my nine cases could in any manner be placed in the latter class.

Various operative procedures have been tried and it is noteworthy that all the methods seem to have given more or less relief of the more urgent symptoms. Two distinct classes of operations have their adherents.

(1) The prolapsed viscera are in some way sutured or suspended in as nearly the normal position as possible, (2) The abdominal capacity is sought to be decreased by narrowing the abdominal wall by plastic methods.

In the correction of gastroptosis by the first or direct suspension, four different methods have been advocated. In the chronological order of the published reports, they are as follows:

(1) Direct suture of the stomach wall to the abdominal wall (Duret, 1894) Gastropexy.

(2) Suture of the gastrophatic and gastrophrenic ligaments to the abdominal wall (Davis 1897) Gastrosuspension.

(3) Shortening of the gastrohepatic and gastrophrenic ligaments (Beyea 1899 though his first case was operated upon in 1897).

(4) Suspending the stomach in a hammock made by suturing the omentum to the abdominal wall (Coffey, 1902).

Numerous variations of these procedures have been used, but I believe none of them are important, and all follow the principles of one of these four methods.

Two procedures have been used to narrow the abdominal wall and thus lift the viscera to their normal positions: (1) A shortening and tightening of the abdominal wall in all its diameters by an extensive plastic operation (Depage, 1893).

(2) Resection and suture of the fascia of the recti muscles when there is a wide diastasis (Webster, 1901).

In addition to these procedures gastroplication has been done for dilatation and gastro-enterostomy for drainage of the stomach, poor drainage being regarded by many as the chief cause of distress.

None of these procedures has met with a very cordial reception at the hands of surgeons or internists. None of them can be expected to so perfectly correct the position that the stomach will be as smooth in all its functions as before gastropsis occurred.

Which operation is the best is not an easy matter to decide. That direct fixation of the stomach to the abdominal wall as done by Duret, Rovsing, and Hartman, and so recently done and advocated by Eve, has serious objections, I pointed out September 16, 1897, in a paper read before the Medical Society of the Missouri Valley, when my first two cases were reported, in the following words:

"As all will recognize, the methods adopted by me are a wide departure from those hitherto practised. In operations reported, the stomach has been anchored in position by suturing it directly to the peritoneal layer of the abdominal wall. Surgeons have frequently been called upon to liberate adhesions binding the stomach to the abdominal wall, on account of the suffering caused. I should hesitate to produce artificially a condition which is so likely to be followed by pain. On the other hand, the lesser omentum is the natural ligament of the

stomach, and if it is shortened or receives a new fastening no unpleasant consequences would be expected to follow."

This is a grave objection to gastropexy by the Duret method, and I had supposed it had become obsolete, having been replaced by suspensions through the medium of the ligaments, but was greatly surprised to find an article by Frederic Eve Surgeon to the London Hospital, as late as April 7, 1906, in which he reports five cases he had operated upon for gastropotosis in three of which he made direct fixation of the stomach to the abdominal wall two inches above the umbilicus. Eve gives as his reason, in one of these cases, for not shortening the lesser omentum, that it was too weak and friable to be depended on. Subject to active peristalsis as the stomach is, it does not seem reasonable that direct fixation will prove satisfactory.

With reference to my method published in 1897, suture of the small omentum near its attachment to the lesser curvature to the abdominal wall as high as possible, it has proven highly satisfactory in the seven cases on which the operation has been done. It is of no more a fixation than the Beyea operation, the stomach swinging from the abdominal wall with the lesser omentum as its ligament instead of from the liver and diaphragm. In two of my nine operations the Beyea method was used. The results were as good as, but no better than, in the seven in which my method was made use of. The chief claim for my method is that it is easier to do, and seems less likely to interfere with the circulation. Again, in many of these cases a hepatopexy is needed at the same time, and it is as well not to have the extra weight of the stomach and colon pulling down on the liver.

I have never made use of the method of Coffey, suspending the stomach in a hammock by fastening the omentum to the abdominal wall. It seems rational and especially applicable in such a case as Eve describes with a lesser omentum so weak as not to be equal to the task of supporting the stomach. The only objection I can see is the possibility of a rotation of the stomach on its axis sufficient to develop a kink at the pylorus.

Gastroplication, in cases of dilatation, seems of little value. If the dilatation is dependent on descensus, when the stomach is raised to its normal position, it will very soon regain its natural size. On the other hand, after plication the dilatation will quickly recur unless the valvular obstruction at the pylorus is corrected.

Gastro-enterostomy has strong advocates, notably Deaver and Walker, and has apparently been followed by fairly satisfactory results. It does not pretend to correct the displacement; it merely prevents the stagnation dependent on the descensus. If, by suspension, the angulation at the pylorus is removed so that the stomach can empty normally the need of gastro-enterostomy no longer exists. That suspension does this has been proven many times. Gastro-enterostomy, even in the hands of the best operators, still has considerable mortality while the suspending operation is practically mortality-free.

The operation of Depage, lessening the capacity of the abdomen by shortening its wall in all its diameters, seems rational, but has serious objections. The ligaments are not shortened, and the unsupported weight of the viscera can scarcely fail to produce a second stretching of the abdominal wall. It seems also to be impossible to accomplish the extensive resection of the wall, as done by Depage, without destroying much of the nerve supply, with resultant paralysis of the muscles and almost certain production of hernia in the course of time, thus producing a condition much worse than the original. The operation is formidable, one of the three cases reported by Depage having died of shock.

The same objections do not apply to the Webster operation, but the diameter mainly at fault is not narrowed. In my observations the worst cases of splanchnoptosis are associated with greater stretching of the vertical than of the transverse diameter.

Whatever suspending operation is adopted, if careful attention is not given to the after-treatment, failure is invited. Several weeks in bed with vigorous massage of the abdominal wall and forced feeding after the operation, seems to promise

most in the extreme cases of splanchnoptosis not relieveable by mechanical and medical means

In prolapse of the liver Jonas' method of holding up the anterior border by means of the gall bladder sutured to the abdominal wall, and the method described by Coffey, of shortening the suspensory ligament and reinforcing this by sutures through the liver substance and the abdominal wall, have been used successfully. I have tried both methods, but am coming to depend more and more on shortening of the suspensory and round ligaments

For prolapse of the transverse colon, Lambotte's method of suturing the wall of the colon directly to the abdominal wall is to be condemned on the same grounds that we condemn direct gastrofexion. It is inviting trouble. The method devised by Coffey for suspending the stomach in a hammock by suturing the great omentum to the abdominal wall, seems even more satisfactory for holding up a prolapsed transverse colon.

In my first case, reported in 1897, the gastrocolic omentum was very long, more than twice its normal length, allowing the transverse colon, after the stomach had been restored to its normal position, to descend much lower than it should. At this time the gastrocolic omentum was reefed by sutures carefully placed so as to avoid interference with the blood supply. The results were entirely satisfactory, but only one case has been met since, which seemed to require such a procedure, Case VI, in which it was done with apparently perfect success.

Apparently most contributors to the surgical literature of splanchnoptosis ignore the existence of enteroptosis, or consider that suspending the stomach corrects the entire trouble, without any direct effort directed to the small intestines. In most cases this is probably true, but sometimes the mesentery is stretched to two or three times its natural length. In such a condition I can see little benefit in suspending the stomach and liver alone. The buoyancy of the small intestines, forming a veritable air cushion on which the liver and stomach rest and constituting no little part towards holding these organs in their



normal position, is lost if the intestines sink to the lowest part of the abdominal cavity, as they do when the mesentery is greatly elongated.

In three cases I have shortened the mesentery in the manner described in Case I, reported in 1897. It is done in much the same manner as Beyea shortens the gastrohepatic omentum, except that, instead of folding the membrane on itself by tier suture, only one suture is introduced between the arteriæ intestinae tenuis, and when it is tied it produces a reef. Many of these sutures are used, and as they are tied the mesentery is shortened as much as desired.

All of my cases have done well, as will be seen by reference to the reports at the end of this article. The putting in of these reefs is not nearly so formidable an operation as it seems, if it is carefully done and the blood-supply duly respected. If we expect to accomplish good results in the surgical treatment of splanchnoptosis all of the prolapsed viscera will have to receive attention in the more aggravated cases.

A brief history of cases operated upon is hereto appended.

CASE I.—Mr. E., farmer, aged 62 years. Reported in *Western Medical Review*, October 15, 1897. Will quote from the description of the operation only to show the technic employed: "The stomach was drawn up into its normal position, and the lesser omentum near its reflection upon the stomach at its lesser curvature was fastened to the peritoneum (in a transverse direction) at the level of the ensiform cartilage by means of fine silk sutures. The stomach was not especially dilated, and gastroplication was not performed. The transverse colon was fully six inches from the greater curvature, the gastrocolic omentum having been greatly stretched. A tuck was taken in the gastrocolic omentum, being careful to avoid the vessels, and not allowing the sutures to penetrate more deeply than through the anterior peritoneal layer of the omentum. This shortened the distance between the transverse colon and greater curvature of the stomach to two or three inches. The small intestines were now brought forward and the mesentery found to be so much elongated that the loops of intestines could be raised four or five

inches above the level of the abdominal wall without undue tension. Beginning now near the upper end of the jejunum, a loop was brought forward. To shorten the mesentery without interference with the intestinal blood supply was the problem before me. The isosceles triangles, bounded at the base by the attached border of the intestine and having for their sides the arteriæ intestinæ tenuis, branches of the superior mesenteric, were elongated, the distance from their apices to their bases being three to four inches. Anything might be done to shorten these triangles if there was no interference with the circulation at their borders. Armed with a long, slender needle, carrying No. 4 silk, the needle was inserted near the apex of a triangle penetrating the mesentery in one direction and brought through in the opposite direction at the centre of the base near the attached border. The suture was drawn through and tied, forming a reef in the mesentery at this point and shortening it from two to three inches. After several sutures had thus been introduced and tied in contiguous triangles, close examination showed that the circulation was unimpeded. Sutures were thus used the entire length of the small intestine, not in every interarterial space, but almost that closely. Between the upper jejunum and the ileocaecal valve ninety-two sutures were employed. There was no shock. The patient did well with the exception of some pain in the region of the loosened adhesions. There was no distension. The bowels moved the third day. The patient was up the twentieth day, and left the hospital August 9 exactly four weeks from the day of operation."

CASE II—Mrs P, aged 30 years. Reported same time as Case I. Four months after the operation she was doing her own housework, which she had not been able to do for many months, and had gained seventeen and one half pounds in weight. She had a child about two years after the operation, and was reported in good health one year ago.

CASE III—Mrs C W, aged 26 years. No children, one miscarriage. Three years ago she began having pain in region of stomach and gall bladder, no acute attacks, but constant pain and distress. Has lost much weight but cannot say how much.

Has been under Dr Bridges' care for several weeks in the M E Hospital. On examination general abdominal tenderness was present, worst over gall-bladder region. Liver in about

normal position, but stomach greatly prolapsed, extending three inches below umbilicus.

Operation, December 22, 1904. Dr. Decker gave ether; Dr. Hull assisted. Incision through right rectus. Thirty stones removed, and gall-bladder drained. Stomach anchored as in Case I. Uneventful recovery, and reported well six months later.

CASE IV.—Mrs. H. S., aged 23 years. One child; one miscarriage. Began having pain in region of stomach and gall-bladder three years ago, and has been growing worse ever since, having lost twenty-five pounds in weight. General abdominal tenderness; no worse over stomach and gall-bladder than elsewhere. Liver greatly prolapsed, and stomach extends below umbilicus. Also has laceration of cervix and perineum.

Operation, January 10, 1905, at M. E. Hospital. Dr. Decker gave ether, and Dr. Hull assisted. Uterus curetted, and cervix and perineum repaired. Then the liver was raised to its normal position and sutured there by stitches through its border. As this was found to restore the stomach to its normal position, it was not anchored. Gall-bladder normal.

Patient made an uninterrupted recovery; all the old pain relieved; and she was in good condition four months later.

CASE V.—Mrs. E. R., aged 27 years; two children; no miscarriages. A year before entering Immanuel Hospital she commenced to feel pain in the left side of the abdomen. The only position of comfort was on her back. Almost impossible to remain long in the upright position. Frequent vomiting and sick headaches. Constipated. The entire abdomen sore, and has a burning sensation. Much flatulency. At the beginning of her trouble was jaundiced, but had no attacks of colic.

Lower border of stomach midway between umbilicus and pubes; liver also much prolapsed. Both kidneys movable.

Operation, August 19, 1905. Dr. Mason gave ether, and Dr. Hull assisted. Incision in median line above umbilicus. Liver and stomach anchored in usual manner. Made an uninterrupted recovery, but has not been heard from since leaving hospital.

CASE VI.—Mrs. J. M., aged 40 years; seven children; no miscarriages. Good health until the past few years, when she began having pain in abdomen, flatulency, constipation, etc.,

which was not very severe until a year ago since which time she has been much of the time confined to her bed under the care of her physician Dr Fitzsimmons of Omaha Nebraska During the year her weight has decreased from 127 pounds to 97 pounds

For one month before I saw her she was in Immanuel Hospital under the care of Dr Milroy who asked me to see her

Abdomen universally tender food causes great distress nausea and often vomiting A general splanchnoptosis diagnosed the liver being three inches below the arch of the ribs and the stomach entirely below the umbilicus when she stands with bulging of the lower abdomen Operation was advised and with the hearty cooperation of Dr Milroy and Dr Fitzsimmons it was carried out November 2 1905

Incision in median line from ensiform cartilage to umbilicus Liver anchored by four double sutures Stomach anchored and the gastrocolic omentum shortened as in Case I Numerous reefs taken in mesentery throughout the entire length of the small intestine the mesentery being greatly lengthened Uneventful recovery When she left the hospital five weeks after operation she felt better than for many months Advices from her two weeks ago state that her health is excellent

CASE VII—Mrs M B aged 39 years three children no miscarriage Has been having a good deal of pain in abdomen and flatulency for past year Constipated Much worse during past month and has resisted all treatment Pain has of late been worse in the left half of the abdomen The patient has been steadily losing weight

On examination a general splanchnoptosis found kidneys liver and stomach all much prolapsed

Operation January 5 1906 Dr Mason gave ether and Dr Hull assisted Incision above umbilicus through right rectus Numerous adhesions found between omentum and anterior abdominal wall These were broken up and the liver was raised to its normal position and anchored The stomach was then suspended by suturing the lesser omentum to the abdominal wall high up The gall bladder was normal with the exception of a few adhesions which were broken up Through this incision a small fibroid was found on the anterior surface of the uterus and an adherent left tube A low incision was now made and the

fibroid enucleated. The left tube and ovary were found to be tubercular and were removed. The adhesions were probably due to a healed tubercular peritonitis.

The patient made a good recovery, and was discharged from the hospital much improved, but I have not been able to hear from her since.

CASE VIII.—Mrs. J. S. J., aged 59 years; has four children; no miscarriages. About four years ago she commenced to have stomach symptoms—pain in region of stomach, eructations of gas, vomiting, and a considerable amount of nausea most of the time. These symptoms have gradually increased in severity, until she has been reduced to a condition of chronic invalidism, being compelled to keep her bed most of the time.

Examination reveals a prolapsed liver to three inches below the arch of the ribs, and the stomach greatly prolapsed, the lesser curvature half way to the pubes. Tenderness almost everywhere over the abdomen, no greater in the regions of the stomach and gall-bladder than in other regions. Before I saw her Dr. Christie had been treating her in Immanuel Hospital for four weeks, and it was by his advice that the operation was done. Her pain before coming to the hospital had been so constant that she had become more or less a morphine habitué.

Operation, July 27, 1906. Ether given by Dr. Stein, Dr. C. A. Hull assisting. Incision in median line from the sternum to the umbilicus. On opening the peritoneum, in addition to the prolapse described, numerous adhesions were found in the region of the gall-bladder, which was found atrophied and containing several stones, which were removed and the gall-bladder drained in the usual manner. Hepatopexy was first done, using sutures through the border of the liver and the peritoneum as high as possible and also suturing the suspensory ligament. The Beyea method was made use of to shorten the gastrohepatic and gastrophrenic ligaments.

The patient has been undergoing rest and massage treatment, but is now about the hospital almost ready for discharge. She still has some pain, but not to compare with what she had before the operation.

CASE IX.—Mrs. L. H., aged 35 years; two children; two miscarriages. For past two years she has had much gastric and abdominal pain, and for the past year has been most of the time

confined to bed Vomits frequently; has constipation, resists all treatment

On examination the liver and stomach were found greatly prolapsed, the greater curvature reaching almost to pubes

Operation, August 18, 1906, at Immanuel Hospital Incision above the umbilicus Liver pushed up into place and anchored Stomach suspended by the Beyea method At the present time she is doing well, and has much less pain

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# TRANSACTIONS

OF THE

## NEW YORK SURGICAL SOCIETY.

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*Stated Meeting, January 23, 1907*

The President, DR GEORGE WOOLSEY, in the Chair

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### MALIGNANT DISEASE OF THE STOMACH

DR. JOSEPH A BLAKE presented a series of three cases as follows

CASE I—A man sixty five years old, who had been operated on ten months before for carcinoma of the pylorus For three or four years prior to the operation he had had dyspeptic symptoms, consisting chiefly in sour stomach and eructations of gas In the year previous to operation he had occasional attacks of vomiting, gradually becoming more frequent and at times large in amount He had suffered some pain after eating, accompanied by a sensation of fulness and distention which was relieved by vomiting In the year preceding operation he had lost about thirty pounds in weight The patient would not allow the passage of a stomach tube Examination of the vomitus showed combined acid about 60, at times no free hydrochloric acid, at other times free hydrochloric, 26 There was no lactic acid and no evidence of prolonged retention

At the operation, which was done on March 31, 1906, an annular growth,  $1\frac{1}{2}$  inches in diameter, was found occupying the site of the pylorus, constricting its lumen for one quarter of an inch The lymphatics were enlarged along the lesser curvature as far as the cardia There was a large lymph node alongside the duodenum, close to the pancreas The growth, with the stomach as far as the cardia, was removed, including the lymph nodes The ends of the duodenum and the stomach were closed, and a



posterior gastrojejunostomy was done by means of a Murphy button with a short loop.

The patient sat up in bed the second day after the operation. He was able to shave himself three days later, and was out of bed on the eighth day. On account of the Murphy button he was kept on fluid diet until the eleventh day, when the button was passed.

Immediately after the operation, he weighed 108 pounds. Four months later he weighed 148 pounds and his present weight is 144 pounds. He had enjoyed perfectly good health, and was attending to his business. There were no symptoms referable to the stomach, excepting that he found that frequent small meals agreed with him better than meals taken at the usual intervals. Examination of the growth showed it to be adenocarcinoma.

CASE II.—A man, forty-one years old, upon whom Dr. Blake had operated eight months ago at the Roosevelt Hospital for carcinoma of the pylorus. The patient had complained of symptoms for twelve months preceding the operation. The first symptoms were a heavy feeling in the epigastrium, and eructations of gas and sour fluid. For eight months he had had obstructive vomiting. There had been no pain, no hæmatemesis, and no blood in the stools. He had lost thirty pounds during the year.

Upon examination, a mass about the size of an egg was felt in the right hypochondrium. There was a distinct splashing sound, and peristaltic waves were evident. The stomach reached two fingers below the umbilicus. The gastric analysis, after a test meal, showed free hydrochloric acid, 14; combined hydrochloric, 37; total acidity, 72; no lactic acid. Starch and glucose were present; no blood; no bacteria.

At operation, a growth was found at the pylorus about 2 inches long by  $1\frac{1}{2}$  inches in diameter, and there were slight lymphatic extensions along the lesser curvature. The mass was movable, and there were no adhesions. The stomach was greatly dilated, extending 2 inches below the umbilicus. The growth, with about 6 inches of the stomach, was excised, the line of excision extending from the cardia to the greater curvature. The end of the duodenum was closed and inverted, and a posterior gastrojejunostomy was done with clamp and suture. Water was given by mouth the day of operation, and the quantity was gradually increased, until the patient was taking 4 ounces every four hours.

The patient vomited once after the operation. On the day after the operation, peptonized milk was given commencing with one drachm, and increased to 2 ounces every two hours. Three days after the operation he was given beef broth, beef juice and egg nog, and on the following day cereals, soft cooked eggs and milk toast. He was kept sitting up in bed as much as possible every day, commencing the day after operation, and was out of bed on the eighth day and allowed to walk on the eleventh day.

The patient's weight on admission, was 97 pounds. Nine days after the operation he weighed 107 pounds, thirteen days after the operation 112 pounds and three months after the operation 147 pounds. His present weight is 171 pounds a gain of 74 pounds.

The microscopical examination of the growth showed it to be carcinoma.

CASE III.—A woman forty nine years of age, who had been operated upon for hæmorrhages from a gastric ulcer, a gastro-enterostomy having been done. This resulted in a "vicious circle," which was finally cured by division of the pylorus.

The patient gave the following history. Thirty three years before, when sixteen years of age, she suffered from dyspepsia and heartburn, with sour eructations. Thirteen years before she had had an attack of epigastric pain, and vomited a lot of coffee-ground material, with blood. Four years before she had again vomited blood. Since that time she had noticed that at times her stools had been tarry. For two weeks before her admission to Roosevelt Hospital she had repeatedly vomited large amounts of blood.

Upon admission, her red blood cells were 1,740,000, hæmoglobin, 40 per cent. The test meal showed moderate hyperacidity. There was tenderness and slight muscular rigidity over the epigastrium, and apparently slight dilatation of the stomach, no tumor was felt. While in the hospital before operation, she had continuous hæmorrhages from the stomach, small in amount.

*On September 15 1906, she was operated on by Dr. L. C. Hotchkiss, who was then on duty, and a posterior gastro-enterostomy was performed by the Peterson method, that is, without an enterostomy, by the short loop. There was apparently a cicatrix at the pylorus, and the pylorus was reddened, but not adherent. Following the operation there was persistent vomiting, the quan-*

tities varying from 2 to 4 ounces two to six times daily. Lavage obtained large amounts—1 to 3 pints—of greenish, foul fluid. The patient began to lose weight, and failed continuously.

On October 16, one month after the first operation, the abdomen was again opened. Some adhesions were found beneath the line of suture, but the anastomosis was technically perfect, the stoma being wide open. There were no adhesions about the pylorus nor in the region of the anastomosis; there was marked dilatation of the stomach and of the entire duodenum. The pylorus was divided, and the ends of the duodenum and of the stomach turned in and closed. The operation was followed by gradual improvement. The vomiting continued, but it was less frequent and gradually subsided entirely, although lavage still brought back some bile-stained fluid. Eleven days after the operation, the patient, while vomiting, burst open the abdominal wound, there having been no effort at repair on the part of the tissues. This was due partly to the patient's asthenic and starved condition and to the fact that the incision of the second operation was in the median line and opposite the first incision. The wound was resutured under cocaine with through-and-through stitches of silkworm gut.

The patient slowly improved after the second operation, and was now nearly able to return to work. There was still, however, evidences of regurgitation of intestinal contents into the stomach. An examination made during the past week showed that on fasting, 120 c.c. of greenish fluid, containing considerable mucus, bile and blood, were withdrawn from the stomach. Total acidity, 20; free hydrochloric acid, 14. At another examination after a test breakfast, 400 c.c. of greenish fluid was withdrawn, with a total acidity of 18; free hydrochloric acid, 4.

On inspection of the abdomen a peristaltic wave could be seen passing from left to right across the epigastrium and upward along the right rectus muscle to the costal margin at the eighth chondrosternal articulation.

Dr. Blake commented on the fact that a gastro-enterostomy with a short loop, even though placed at the most dependent part of the stomach and with the opening directed in the manner that Mayo had recommended, might be followed by the "vicious circle" when the pylorus was open. The division of the pylorus in this case, although improving the patient's condition, had not

proved an absolute remedy, inasmuch as there was still regurgitation of the intestinal contents into the stomach. It was also interesting to observe that although the pylorus was closed and the stoma was open, there was still an effort, as evidenced by the peristaltic wave, on the part of the stomach to force its contents through the pylorus.

DR CHAS H PECK presented a man sixty six years old, who was operated on for carcinoma of the stomach on July 13, 1906 a partial gastrectomy by Mayo's method being done. The patient's symptoms had been gradually increasing for a period of more than five years, probably indicating that the growth developed in the base of an old ulcer. This case had already been reported in full at a meeting of the New York Surgical Society on October 24, 1906. The patient had continued to gain in flesh and strength, he could eat solid food in ample quantity without distress, and weighed 35 pounds more than at the time of operation.

#### PERFORATIVE LESIONS OF THE STOMACH

DR CHARLES H PECK presented the following cases

CASE I *Perforation of the Stomach with Spreading Peritonitis*—A male forty two years old, was brought to Roosevelt Hospital on June 9 1906 who had been taken suddenly ill with violent abdominal pain while walking in the street that morning. The pain was not relieved by an injection of morphine, and he was sent to the hospital by his physician late in the afternoon. He had been operated on about five years before for an abscess in the epigastric region and had suffered more or less from indigestion ever since.

On admission, he presented the signs of an extensive peritonitis, with generalized tenderness and rigidity, and moderate distention. The symptoms were most marked in the right half of the abdomen as low as the iliac fossa. A diagnosis was made of perforative appendicitis with spreading peritonitis, and an immediate operation was done, about ten hours after the onset of the pain.

The appendix was removed through an intermuscular incision, and showed no evidence of disease excepting moderate inflammation of its external coats. There was a large quantity of turbid fluid of aromatic odor and showing oil droplets, free in the peritoneal cavity. The wound was closed, and a median incision

made in the epigastric region. A perforation on the anterior wall of the stomach was found, through which the stomach contents were escaping. The perforation was closed by a purse-string suture, buried by silk Lembert's sutures. The peritoneal cavity was thoroughly flushed out with saline solution through a Blake tube, and the wound was closed, excepting at the point of emergence of a cigarette drain, which was left down to the site of the perforation.

The patient's convalescence was uninterrupted. The wounds healed promptly, and he left the hospital on June 28, nineteen days after the operation. He had since remained in good health and without pronounced gastric symptoms.

The aromatic odor of the fluid that had been found in the peritoneal cavity, and the oil droplets which it contained, were *afterwards accounted for by the statement of the patient that he had taken some fragrant preparation of castor oil shortly after the onset of his pain.*

CASE II. *Perforated Gastric Ulcer; General Peritonitis.*—A female; twenty--three years old, was operated on December 17, 1905, for perforated gastric ulcer with generalized peritonitis. Symptoms of perforation had occurred twenty-nine hours before operation. The same technique was employed as in his other cases of perforation, and the patient made a good recovery. She gained in weight, and was now able to take a variety of solid foods without distress. She was presented at a meeting of the New York Surgical Society on February 28, 1906, and had now remained free from symptoms of ulcer for more than a year, in spite of the fact that no gastro-enterostomy was performed.

Dr Peck said that in addition to the two cases of acute perforation presented, he had operated upon four others during the past three years. Two of these, operated upon at four and six hours respectively from the onset of symptoms of perforation, made good recoveries, and both were well when last heard from, but could not be located at the present time. Both were shown before the New York Surgical Society on February 24, 1904. Two others, one operated on at thirty-six and the other at fifty-three hours after perforation, died of peritonitis, which was well advanced in each case at the time of operation. The same technique was employed in all six cases of acute perforation. Gastro-enterostomy was not performed, and the only drain used was a

single cigarette down to the site of perforation in event of leakage. No leakage of the stomach contents occurred in any of the six cases, although the infiltration surrounding the perforation was so great in several of the cases as to render satisfactory suturing very difficult.

**CASE III** *Chronic Gastric Ulcer, Gastro-enterostomy*—A married woman, forty years old, was taken ill in September, 1905, with pain after eating and vomiting. Prior to that she had always enjoyed good health. She was a moderate beer and tea drinker. Two weeks after the onset of her illness she vomited blood, and for several days her stools were tarry. The pain and vomiting persisted, and the patient lost flesh and strength. On February 23, 1906 she had another attack of hæmatemesis, followed by tarry stools. She was brought to the hospital and remained under medical treatment until the following April. Her pain and vomiting recurred soon after resuming work, and on August 11 she had another gastric hæmorrhage. Her pain always occurred soon after eating, and was relieved by vomiting. It radiated to the back and left shoulder. There was tenderness over the epigastrium. She had lost about 44 pounds in weight and was very pale. An examination of the blood showed 40 per cent of hæmoglobin, red blood cells, 3,200,000, free hydrochloric acid, present. The case was regarded as one of chronic gastric ulcer.

**Operation, August 24, 1906.** An incision was made to the right of the median line, and the stomach drawn into the wound. Signs of ulcer were found on the anterior surface, near the middle of the lesser curvature. The omentum was adherent over the site of the ulcer, and the wall of the stomach was thickened and indurated. A posterior gastro-enterostomy was done by suture, with the short loop. The direction of the gut was from right to left. The opening was  $1\frac{1}{2}$  inches long, and was closed by two rows of silk sutures. The edges of the wound in the mesocolon were sutured to the stomach with catgut, and the wound was closed layer by layer, without drainage, with catgut, chromic gut, silkworm and silk.

The patient was allowed water by the mouth after twelve hours, and peptonized milk on the second day. Soft solids on the seventh day. No vomiting or pain followed the operation, and her convalescence was uneventful. She was out of bed on

the eighteenth day, and left the hospital, well, two days later. She had since remained well, and had gained 15 pounds in weight. She was able to eat solid food without distress.

#### GASTRIC AND INTESTINAL LESIONS.

DR. LUCIUS W. HOTCHKISS presented a series of cases, as follows:

CASE I. *Pyloric Stenosis from Old Ulcer; Posterior Gastro-enterostomy*.—A boy, nineteen years old, was admitted with a long-standing history of stomach trouble. His family history was negative. He stated that he had had an osteomyelitis of the lower jaw when he was twelve years old, which prevented him from eating solid food for a period of four months. He was operated on at the time, and a greater part of the jaw was removed. It was fair to assume that during his illness he had a more or less constant septic discharge into the mouth, which, together with his inability to chew, might probably be regarded as a causative factor in the stomach trouble, which began to disturb him seriously about three years later.

About four years ago he began to have a steady, non-radiating pain in the region of the stomach, which was at first relieved somewhat by eating. For over three years he had no other symptoms. Then he began to vomit regularly, about half an hour after each meal. The vomitus was copious and sour to the taste. It had never contained blood. He also complained of eructations of gas. His appetite remained good, but the food was not long retained. During the past few months he had lost 20 pounds in weight.

Physical examination showed a poorly nourished boy, of small frame. There was slight tenderness in the epigastric region, and the stomach was visibly dilated. He had been treated under various diagnoses for many weeks without much benefit, although systematic lavage had relieved him somewhat, but he was growing constantly weaker. A gastric analysis showed a total acidity of 70; free hydrochloric acid, 44. A blood test was negative.

A gastro-enterostomy was done on December 29, 1906, from which the patient made an uninterrupted recovery. He had not vomited since the operation, and had gained 14 pounds in weight. The operation done was a posterior gastro-enterostomy by suture

after the latest method described by Mayo. It was easily performed although there was the scar of an old ulcer, and adhesions on the posterior surface of the stomach almost at the point selected for the anastomosis.

**CASE II** *Cyst of the Mesentery of the Small Intestine, Torsion of Cyst on its Pedicle, with Strangulation and Obstruction of the Small Intestine, Beginning Peritonitis, Removal of Cyst, Resection, End to End Anastomosis of Gut with Murphy Button, Recovery*—A woman, fifty years old, was admitted to Roosevelt Hospital on August 28, 1906. Her family history was negative. Her menses recurred four years after the supposed menopause, and the flow lasted a month, accompanied by cramp-like pains. This was one year ago. Since then there had been no vaginal discharge. The patient stated that twenty years ago she had an attack of illness similar to the present one, but without swelling of the abdomen. That attack lasted about a month. For the past two years she had lost flesh and strength.

One month before admission, after exertion, she had a sharp pain in the left side of the abdomen in the nipple line. This lasted about a week. During this period she also had looseness of the bowels, but she was not compelled to give up her work. About eleven days before coming to the hospital she was seized with a sharp, tearing pain in the abdomen radiating from the right iliac fossa. She vomited frequently, felt "hot and cold," had diarrhoea, and later her abdomen began to swell. She said her vomitus was "black and sour."

When the patient was admitted to the hospital, her symptoms still persisted, and there were undoubted indications of intestinal obstruction. Examination showed a thin, little woman, with a much distended abdomen and slight tenderness low down in the right iliac fossa. There was dullness in both flanks and general abdominal distention, which was most marked in the epigastrium.

**Operation, August 28, 1906.** An incision was made through the right rectus below the umbilicus. On introducing the hand into the peritoneal cavity to locate the seat of obstruction, a large cystic tumor was felt which was at first thought to be ovarian, but on bringing it into view it proved to be a cyst growing from the under layer of the mesentery of the small intestine. It had a considerable pedicle derived from the mesentery, and was rotated upon this pedicle, much as an ovarian cyst might be. In



its rotation, it had caused a complete obstruction, as well as strangulation and gangrene of the loop of gut involved, and about this loop, which ruptured when it was released, there was a considerable area of advancing peritonitis. The cyst was removed, and about 8 inches of gut resected. The ends of the gut were rapidly joined with the Murphy button, as the patient's condition was not promising. The abdominal wound was closed after irrigation of the peritoneal cavity with hot, normal salt solution. The convalescence was stormy, and in the course of a few days a fæcal fistula developed; this at first discharged very profusely, but the amount gradually decreased, and the patient was sent home. She subsequently returned with a small, slightly discharging fistula, which is to be repaired by operation.

The cyst that had been removed was structureless, and contained clear fluid. The loop of excised intestine was reported by the pathologist to be gangrenous. The case was regarded as remarkable in that the cyst was pedunculated and very evidently the cause of the obstruction by producing a kink of the loop of small intestine at some distance from it. It was remarkable also in that it could be tied off from the mesentery without cutting off the circulation to the corresponding segment of gut which was distended above the point of obstruction. The cyst was pear-shaped, with moderately thick walls, and was about 5 inches long.

CASE III. *Adenoma of the Cæcum; Perforation; Abscess, Simulating Appendicitis; Resection of Cæcum; Lateral Anastomosis between Ileum and Ascending Colon by Suture.*—A boy, twenty-two years old, was admitted to Roosevelt Hospital on August 1, 1906. Four weeks prior to that date he had an attack of pain in the appendiceal region, and noticed a feeling of "hardness" in that locality. The pain and tenderness had lasted for two or three days, but he kept at work. The pain was dull in character, and did not radiate. A week ago he had a milder attack of pain in the same region, and noticed a lump which gradually increased in size. The pain was worse after a day's work. He kept at his occupation, however, which was that of a grocer's clerk, until the day of his admission, when he came to the hospital to find out what the lump was. He had had no chills nor vomiting, and had not noticed that he was feverish. His bowels for the past month had been regular under the use of

laxatives. He had a slight cough. His general condition was fair. His urine showed a slight trace of albumin. His temperature, on admission was 100 degrees F, pulse, 112. The abdomen showed a slight bulging in the right iliac region, and there was a slight sense of rigidity on that side, low down. In the right iliac fossa there was a smooth, rounded mass, about the size of an orange. This was slightly tender and flat on percussion. It seemed to be attached to the posterior wall of the abdomen. The leucocyte count was 16,400.

Operation, August 2, 1906. The muscles were split over the site of the mass in the right iliac fossa, and the incision extended when the true nature of the case was discovered. On opening the peritoneum an encapsulated abscess was found, and the appendix was sought for and removed. As the latter organ did not show sufficient change to account for the patient's condition, a further exploration was made, and a growth involving the cæcum was discovered. The wall of the cæcum was soft, and easily perforated by the finger. The wound was enlarged by means of Weir's incision through the posterior rectal sheath, and through this the cæcum was readily isolated and delivered. The cæcum and lower end of the ileum were resected, their respective ends turned in by suture and a lateral anastomosis effected by suture between the side of the ileum and the side of the ascending colon.

After the first week the patient's convalescence was uneventful, and he was discharged well, in about a month. Since then he has steadily improved in weight and strength, and he is now enjoying excellent health. The pathologist reported the growth to be an adenoma.

CASE IV *Intra abdominal Omental Torsion, Resection of Omentum, Recovery*—A man of twenty nine was admitted to Roosevelt Hospital on August 3 1906 with the following history. Five days before admission a right sided hernia, which had been down, reduced itself spontaneously and without pain. About the same time the patient began to have pain in the right iliac fossa. This was of a sharp non radiating character, which persisted and gradually grew worse. There was no history of chill nor vomiting and no urinary symptoms. The bowels had been regular up to the time of admission. The patient had worked until two days before and had then taken to his bed on account of

the increasing pain and the abdominal discomfort. He had had a right inguinal hernia for the past six years, which had always been reducible. During the past year the patient had worn a truss.

On admission, the patient's general condition was good. There was slight abdominal fulness on the right side, especially over the appendix. There was marked rigidity of the right rectus muscle, and a palpable mass in the appendiceal region, extending into the pelvis. This mass was moderately tender. The patient's temperature, on admission, was 101.6; pulse, 128; respirations, 24; leucocytosis, 15,200.

Operation, August 4, 1906: On account of the uncertainty of the diagnosis, a Kammerer incision was made through the right rectus, which was later extended upward above the level of the umbilicus to allow room for the necessary manipulations. On opening the peritoneal cavity, some bloody serum escaped, and a large mass was discovered occupying the lower abdomen and pelvis. This was finally made out to consist of omentum, twisted upon itself, hardened and infiltrated with serum, and apparently strangulated. The appendix was somewhat involved in the infiltration, and was removed. The omentum was found to be adherent at some point in the pelvis near the brim, and to the side of the appendix, but it was easily torn away. The internal inguinal ring was examined, and it was free from omentum. The omentum was ligated close to the transverse colon and removed.

The specimen proved to be a large mass of strangulated omentum, twisted about eight times around a narrow pedicle close to the transverse colon. The whole mass was spindle-shaped, and resembled a hepatized lung in color and consistency. It measured about 10 inches long and about 6 in diameter at its thickest point. The twists were in the long axis, and from right to left. The tip was beginning to become necrotic. The weight was between 5 and 6 pounds.

The patient had some abdominal distention on the day following the operation, but his convalescence was otherwise uneventful. The specimen, which was also shown by Dr. Hotchkiss, had preserved most of its color and contour, and illustrated fairly well the condition found at the time of operation. The patient had been perfectly well since.

A CRITICAL REVIEW OF A RECENT SERIES OF OPERATIONS  
UPON THE STOMACH

DR GEORGE EMERSON BREWER read a paper with the above title, for which see page 687

In connection with this paper, Dr Brewer showed a series of cases of benign lesions of the stomach upon which he had operated at Roosevelt Hospital

DR ARPAD G GERSTER said that the report of the failures so frankly included by Dr Brewer in his interesting paper could probably be duplicated by every surgeon who had occasion to do these operations for gastric disturbance. The lesson to be drawn from such experiences was that the surgeon should be extremely conservative, especially in dealing with women, and refuse to operate in the absence of symptoms indicative of definite and characteristic pathological changes. Among his curative failures Dr Gerster reported a case of posterior gastro enterostomy with the Murphy button, done for the relief of a spastic stenosis, in which, probably on account of some defect in its make up, the button failed to come away, and a radiograph showed that it was still *in situ*. The stomach was again opened and the button withdrawn. About a month later the patient again began to complain, and upon re opening the stomach for the third time a stenosis was found at the previous site of the button, for the relief of which a Heineke Mikulicz plastic operation was done, and further recovery was uneventful but the original gastric complaint remained little improved.

The speaker said he had met with cases of gastric neurosis in which the subjective symptoms were of the most puzzling and complicated character, and in which new symptoms were constantly cropping up. Dr Mayo had recently told him that in dealing with gastric disorders in women, in the absence of hæmorrhage, or of symptoms of stenosis or tumor, demonstrated by a probatory incision, he would refuse to make anastomosis. With the present more precise methods of diagnosis that the surgeon had at his command, the results of operations upon the stomach were steadily improving. Care should be taken, however, not to confound reflex with intrinsic symptoms, and we were justified in doing gastro enterostomy only where there were demonstrable symptoms of such gravity that they could not be mistaken. The

speaker said that of 26 gastro-enterostomies done in his service at Mt. Sinai Hospital during the past five years for ulcer and stenosis, including 2 resection, there were only 2 deaths. Once only a condition resembling a "vicious circle" developed, which was corrected by a subsequent anastomosis between the two legs of the small intestine. In all these operations, as well as in a far larger number of cases of carcinoma, the Murphy button was usually employed, and, with the exception of the case he had already referred to, he had never seen any untoward effects from its use. He could not say the same in regard to its use in entero-enterostomy. He had found it especially serviceable in cases where a rapid operation was indicated. While theoretically the suture method was better, nevertheless, the use of the button should not be neglected, and the surgeon should be able promptly *to resort to it in cases where it was indicated.*

DR. CHARLES L. SCUDDER, of Boston, said the results of the operations presented in this series of stomach cases are very satisfactory. Cases of carcinoma of the stomach are to be grouped into two large classes: first, those which, in the absence of adhesions and visible metastases, lend themselves to a partial gastrectomy; and, second, those in which, in view of pyloric stenosis or interference with gastric motility, a gastrojejunostomy is indicated. The perfection of technique and the slight shock attending a partial gastrectomy are suggestive that a partial gastrectomy will be applicable to certain cases which hitherto have been treated by a gastrojejunostomy. In other words, partial gastrectomy may serve as a palliative operation. In certain well selected cases partial gastrectomy will afford a life of greater comfort than that following a gastro-enterostomy. This thought is suggested by the report of the cases shown.

DR. HOWARD LILIENTHAL, in referring to the technique of gastro-enterostomy, said there was one point in connection with the method that he had learned quite by accident, and he had employed it during the past two years with much satisfaction. Briefly, it was this: A hat-pin was inserted through the loop of intestine and another through the stomach at the points where the anastomosis was to be made. The sharp ends of the pins were then buried in small corks, while the heads of the pins were held by an assistant. The posterior walls were then closed by two layers of sutures, the pins removed and the line of union com-

pleted The needles gave the surgeon an absolutely safe landmark for his incision, and he could feel assured that the deep sutures had included all of the coats thus insuring absolute hæmostasis

Dr Lilienthal said he had recently operated on two cases of congenital pyloric stenosis, one at the age of seven weeks, the other at nine weeks In both of these he used the hat pin method The use of the Murphy button was out of the question, as the small intestine was not larger than an ordinary lead pencil The first case made a perfect recovery, and was still alive and well after three months In the second case, the child's recovery was interrupted by the necessity of a mastoid operation and died from the added shock

DR GEORGE WOOLSEY referred to a case which was operated on two years ago last summer There was an indurated mass involving the pylorus, which was supposed to be a carcinoma A gastro enterostomy was done and in the course of time there was a complete disappearance of the mass which was doubtless an indurated ulcer instead of a new growth

In speaking of the cases of gastric neurosis reported by Dr Brewer, Dr Woolsey mentioned the case of a woman who developed severe gastric symptoms after a curettage She was treated for several months on the medical side of the Presbyterian Hospital, but the vomiting and emaciation persisted She was finally transferred to the surgical side and a gastro enterostomy was done, but without marked improvement

*Stated Meeting, February 13, 1907.*

The President, DR. GEORGE WOOLSEY, in the chair.

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### THREE LAPAROTOMIES IN AN INFANT.

CHARLES A. ELSBERG presented an infant who was ten months old when he was first seen by Dr. Elsberg on April 30, 1906. Two days prior to that he had swallowed a button. The physician who was called gave the child a dose of castor oil, after which the button was passed, with considerable colic. The cramps persisted and grew worse on the following day. The bowels refused to move, the abdomen became distended and vomiting set in. On the third day of the illness the vomiting became more frequent, the abdomen was tender and much distended, and a tumor was felt in the left iliac region. In addition to this, by bimanual palpation, a mass was felt in the right iliac region.

A diagnosis of intussusception was made, and the abdomen was opened a few hours later. There was considerable free fluid, and an ileocæcal intussusception which extended into the sigmoid flexure. The reduction was exceedingly difficult. The last few inches of the ileum were much swollen, the peritoneal coat was destroyed, and the adhesions so firm that they could hardly be separated. Reduction was finally accomplished, and the abdomen was closed. The bowels moved twelve hours later, and in ten days the child was well.

Four weeks later, Dr. Elsberg was again called to see the patient. He learned that for eight hours the child had been vomiting, the bowels had refused to move, and the abdomen had become distended and tender. As soon as the child could be brought to the hospital, the abdomen was re-opened through the old scar. The ileum was found much distended, and the cæcum was constricted by a band. This was divided between ligatures, the bare surfaces were covered with peritoneum, and the abdomen was closed. Symptoms of shock persisted for twenty-four hours; then faecal matter was passed, and the child's general condition improved. After ten days recovery was complete.

Six weeks later, when the child was just one year old, he was again called to see the patient. There had been, for twenty-

four hours symptoms of intestinal obstruction. The abdomen was again much distended and cathartics and high and low enemata had been ineffectual in moving the bowels. The child was vomiting feculent material which was a very rare symptom in one that age. By bimanual examination a distended loop of intestine was felt in the umbilical region. The patient was almost in a state of collapse. Again the abdomen was opened through the old scar. The intestines were enormously distended rendering much manipulation impossible. A band was found which had strangulated a loop of ileum. This was divided between ligatures and covered with peritoneum. On account of the poor condition of the patient further manipulations were deemed inadvisable and the abdomen was closed. The child made an uneventful recovery from this third laparotomy and had since remained well.

#### NEPHRECTOMY FOR HYDRONEPHROSIS

DR F TILDEN BROWN presented a woman who had been operated on about three weeks ago and the chief reason for presenting her was to call attention to the fact that in these cases of hydronephrosis a positive diagnosis could be so readily made by ureteral catheterization tests.

The salient facts of the case were that she had a rapidly growing tumor on the right side which eventually attained the size of an adult head. A diagnosis of kidney tumor was established by ureteral catheterization and this was verified upon exposing the kidney through the usual lumbar incision. Upon separating the fatty tissue capsule an area was exposed where the kidney cortex was so much attenuated that urine escaped. The kidney was thereupon removed as even a very careful reposition of the organ would not have been a safe procedure.

The woman made an uninterrupted convalescence and in presenting her Dr Brown made a plea for a more exhaustive preoperative examination and diagnosis in cases of probable kidney tumors.

#### CYSTOTOMY FOR LARGE VESICAL CALCULUS NOT DEMONSTRATED BY THE X RAY

DR BROWN presented a man who came under his observation about a year ago. His symptoms indicated the presence of a vesical calculus and upon cystoscopic examination a large stone



could be both seen and felt. Several very careful radiographic exposures had failed to reveal the presence of the stone in the bladder.

The vesical calculus was removed by suprapubic cystotomy, and the man made an uneventful recovery from the operation. He had some residual urine prior to the operation, and he was still incapable of completely emptying his bladder, although there were no evidences of prostatic enlargement. There was loss of sexual inclination and ability since the removal of the stone. In connection with this feature, the speaker called attention to the fact that Dr. Howard Lilienthal had always maintained that its possible occurrence was an argument in favor of suprapubic prostatectomy instead of the perineal operation.

In reply to a question, Dr. Brown said the stone was composed of urate of soda and uric acid.

DR. ALEXANDER B. JOHNSON said it was in his experience always impossible to detect stones of that composition with the X-rays. Stones containing uric acid or urates merely were, however, rare, and the usual small percentage of oxalate of lime in such stones rendered their detection comparatively easy in most cases; as he had pointed out in a paper published some years ago.

DR. BROWN said that after the removal of the stone from the bladder, Dr. Caldwell had found no difficulty in getting an excellent radiographic picture of it. The composition of the stone was the main reason for the failure of the X-ray to detect it while it was in the bladder.

DR. CHARLES H. PECK said he had had a similar experience with a stone about half the size of the one removed by Dr. Brown. The X-ray pictures in that case were taken by Dr. Cole at Roosevelt Hospital, and failed to show the presence of the stone in the bladder, although the usual landmarks of the pelvis were clearly defined.

DR. WOOLSEY said that he also had had a similar experience in a case of renal calculus, where a stone of considerable size was removed from the pelvis of the kidney subsequent to negative radiographic findings.

#### LARGE BRANCHED CALCULUS IN EACH KIDNEY.

DR. BROWN presented radiographic pictures, which were taken by Dr. Caldwell, and which showed, in a striking manner,

the presence of a large calculus in each kidney. In reply to a question, Dr Brown said there were no evidences of infection of the kidney in this case, and the urine was not particularly faulty. The patient had not yet been operated on.

DR WOOLSEY said he had at present under his observation a case in which a large branched calculus had been removed from one kidney. In that case, both kidneys had become infected, and on that account a nephrectomy was out of the question, although the kidney that had been operated on showed marked evidences of destruction by the suppurative process. The ultimate outcome of the case was only a question of time.

#### STONE IN THE URETER

DR BROWN presented a young man who had been referred to him by Dr John Rogers. The history of the case dated back for several years, during which period the patient had suffered from repeated attacks of pain in the lower abdomen which had been pronounced by various physicians whom he had consulted as bilious attacks, or as attacks of appendicitis.

When Dr Rogers saw the patient he suspected that the pain might be connected with the kidney and an X ray was taken which showed a stone in the ureter just below the sacro-iliac synchondrosis. Palliative treatment was tried for a time without any result. One evening, about three weeks ago, while the patient was on his way home from business, and after two days of very constant pain in the region of the lower ureter he had a sudden inclination to void urine. While performing the act there was a sudden painful stoppage of the flow, followed by the spontaneous discharge of a hard object which was lost. Upon his arrival home, he found that his clothing was blood-stained, and the urethra continued to ooze blood for some time. X-ray pictures taken since that time had been negative, and the natural deduction was that the ureteral calculus had been expelled spontaneously. Dr Brown said the case was a good illustration of the fact that in dealing with ureteral calculi, we should not rush to operate unless the symptoms were grave and urgent.

DR JOHN ROGERS said the case was also a good illustration of the fact of how easily a mistaken diagnosis of appendicitis could be made. This patient had consulted at least three members of the New York Surgical Society, and in each instance he was

told without hesitation that he should be operated on for appendicitis. Subsequently, his attending physician in the country detected a little blood in the urine, and this fact, Dr. Rogers said, had induced him to have the X-ray picture taken which revealed the ureteral calculus.

DR. WOOLSEY recalled one case of supposed appendicitis where the presence of blood in the urine led to the suspicion of ureteral calculus. X-ray pictures gave a negative result, but the patient subsequently passed a small uric acid calculus.

#### SARCOMA OF THE ULNA.

DR. WILLIAM B. COLEY presented a man, twenty-five years old, whose family history was good. On December 8, 1898, Dr. George Tully Vaughan amputated the right arm in the lower third for sarcoma of the ulna. The patient at that time gave a history of having had a "greenstick" fracture of the right ulna three years before, from which he recovered. Two and a half years later, the bone began to enlarge at the site of the fracture, and about three months later it broke at this point, as a result of throwing a stone or cob. Examination at that time (three years after the "greenstick" fracture) showed a spindle-shaped enlargement of the middle of the right forearm, the circumference being  $1\frac{1}{2}$  inches larger than the left. The surface temperature was distinctly higher than on the left forearm. The swelling was firm, semi-fluctuating, not tender, except at a point on the border of the ulna where motion and crepitus were felt. A skiagraph showed a fracture of the ulna in the middle third and a mass springing from the upper border of the ulna and extending towards the radius. Subsequent exploratory incision showed this mass to be soft, like granulation tissue, attached entirely to the interosseous border and mainly to the upper fragment. A piece was removed for microscopical examination which was made by Drs. Kingdon and Sprague, who pronounced it round-celled sarcoma with a few spindle cells. The patient made a good recovery and remained well until February, 1906, when he noticed an increase in the size of his abdomen, but as he had no pain or discomfort from this swelling, he paid no attention to it. In the early part of October he began to have pain and consulted Dr. J. W. Perkins of Kansas City, Mo., who referred him to Dr. Coley. Physical examination made by Dr. Coley on October

29, showed the patient to be well nourished, having apparently not lost much weight, although he was anæmic. Right arm was absent, there was no local recurrence, nor were there any signs of a return of the disease in the axilla. Examination of the abdomen showed the same markedly protuberant and symmetrically enlarged. Palpation showed the abdomen filled with an enormous tumor, extending from the ensiform cartilage nearly to the symphysis pubis. The intestines are pushed over to the left side. Several large masses, each the size of a child's head, more or less independent from one another could be made out. They seemed to start in the retroperitoneal glands or omentum. The patient was put upon the mixed toxins of erysipelas and bacillus prodigiosus on November 1, 1906, with little hope of doing him much good, but at the end of one month's treatment the masses in the abdomen had decreased in size so much that the circumference at the umbilicus was 5 inches less than when the toxins were begun. He is still under treatment and has improved very much in general health. He has had the toxins regularly up to the present time, in doses as high as 10 minims four to five times a week. All the injections have been made in the pectoral region. He has had three intervals of rest, the last period for two weeks. He returned to the hospital yesterday and although he gained 5 pounds while away his tumors are distinctly larger. The tumors have apparently decreased one-half to two-thirds since the beginning of the treatment.

#### INOPERABLE SPINDLE CELLED SARCOMA OF THE ABDOMINAL WALL AND PELVIS

DR COLEY presented a man aged thirty years. In December, 1892, the patient, then sixteen years of age, was seen in consultation with Dr L. Bolton Bangs, at the Post Graduate Hospital. The tumor was 7 by 4 inches in area, extended up nearly to the umbilicus and was deeply attached to the pelvis below and, in Dr Bangs' opinion, the bladder wall was involved. The tumor was clearly inoperable and was growing rapidly. A section was removed and examined by Dr H. T. Brooks, the pathologist to the hospital, who pronounced it a spindle celled sarcoma. The patient was placed in charge of Dr Coley by Dr Bangs and was admitted to the New York Cancer Hospital early in February, 1893. The treatment with the mixed toxins of erysipelas and

bacillus prodigiosus was begun at once by local injections into the tumor and kept up for nearly six months. At the end of this time the tumor had entirely disappeared by absorption, without breaking down. The patient was shown before the New York Surgical Society about seven years ago and has since been under occasional observation. He has been in perfect health since he left the hospital nearly fourteen years ago and there has never been any sign of local or general recurrence.

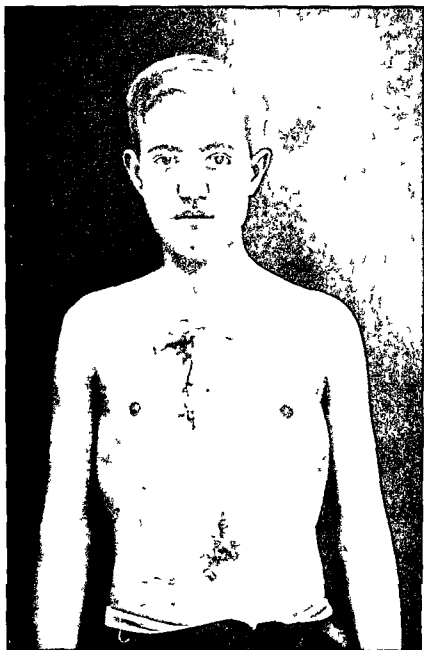
It may of interest to note that seven years ago he had a typical primary lesion of syphilis.

#### ESOPHAGEAL-THORACIC FISTULA.

DR. WILLIAM A. DOWNES presented a man, aged twenty-two years, whose previous history was negative. In April, 1903, he noticed a swelling on the right side of the chest which gradually attained the size of a small orange. After a week's poulticing it was incised and a quantity of dark-colored foul pus was evacuated. The discharge from this abscess persisted, together with a temperature elevation. The case was regarded as one of tuberculosis of the sternum, and the original incision was enlarged and the wound curetted. The patient improved temporarily, but in the course of six weeks he again applied for treatment, and the wound was again curetted. The wound failed to heal, and the patient was admitted to the General Memorial Hospital on October 15, 1903, and a radical operation for tuberculosis of the sternum was done two weeks later. Through a very large incision, the right half of the sternum was exposed, and a part of the gladiolus and manubrium was excised, together with a part of the 2, 3 and 4 ribs. In the median line there was an old sinus which could not be probed to its full depth.

Four days after this operation an orange pit was expelled through the wound, and from that time on food taken by the mouth escaped through the old sinus. The patient's condition became so poor that a gastrostomy was done on November 15, 1903, and for the following year he was fed regularly through the gastrostomy wound, and in that period he gained about 40 pounds in weight. Recently, Dr. Downes said, the patient had again begun to lose weight. The gastrostomy wound has not been allowed to close, but the patient was feeding himself in the usual way (Fig. 1). There was still, occasionally, a little leak-

FIG. 1



Dr. Dowies case of oesophageal thoracic fistula. Photograph taken one year after gastrostomy. Notice low position of opening into stomach made necessary by enlargement of liver due probably to congestion.



age of pus through the sinus in the chest wall. The man was up and about, and able to do a moderate amount of work. Pathological examination of tissue removed from the sternum showed no evidence of tuberculosis.

These cases of œsophageal thoracic fistula, the speaker said, were very rare. When Dr Osler reported a case in the Johns Hopkins Hospital in 1894 he was able to find only two similar cases on record. Since that time (in 1905) Dr Alexander B Johnson had reported one that came under his care in the New York Hospital.

DR ALEXANDER B JOHNSON said the patient shown by Dr Downes had been under his care for some time at the New York Hospital, and he had twice operated on him for the tubercular process involving the sternum, but both operations were prior to the detection of the œsophageal thoracic fistula.

In connection with this case, Dr Johnson exhibited a photograph of a case of œsophageal thoracic fistula that was under his care at the New York Hospital in 1905. The patient was a child with a supposed abscess of the lung or empyema. A large tuberculous thoracic abscess was found and evacuated, and from that time on the child's food began to be expelled through the wound in the chest wall. In order to feed her, a gastrostomy became necessary. The child improved for a time, but in the course of a few weeks she developed a tubercular peritonitis and gradually failed and died.

DR DOWNES, in closing, said that the presence of a stricture of the œsophagus was eliminated by the fact that a normal sized stomach tube could be passed. Upon one occasion, the fistula was filled with bismuth solution, and an X-ray picture was taken in an attempt to locate the opening into the œsophagus, but without any success. There were no indications of stricture, and no history of the patient having swallowed any acid or anything that would have been apt to cause a stricture. The etiological factor in the case had been regarded as a suppurating mediastinal gland, with involvement of the œsophagus, and final rupture. The speaker said he had seen two cases at St Mary's Hospital for Children where sudden death was due to rupture of a suppurating mediastinal gland into the trachea. In the case he had shown, as well as in the one referred to by Dr Johnson, the club shaped condition of the fingers was very marked.



## PERFORATING ULCER OF THE STOMACH.

DR. DOWNES presented a woman, thirty-three years old, with a history of ulcer of the stomach of several years' standing. In February, 1906, she was admitted to the General Memorial Hospital, and under appropriate treatment, her gastric symptoms disappeared, so that she was able to return to her home and resume her usual duties. Subsequently, however, her symptoms recurred, and on December 11, 1906, after drinking a glass of vichy and milk, she immediately experienced a violent pain in the epigastrium, and went into moderate collapse. She was seen at that time by Dr. Walton Martin, who regarded the case as one of probable perforated gastric ulcer.

When the patient was admitted to the hospital, she gave no history of vomiting. The abdomen was extremely hard and board-like. Operation seven hours after rupture. Upon opening the abdomen there was an escape of gas and free fluid in the peritoneal cavity. A perforation was found in the anterior wall of the stomach. It was large enough to easily admit the end of the index finger, and surrounded by an indurated area, which it was thought wise to excise freely. The wound, about 3 inches in length, was closed with three rows of sutures, first interrupted inverting and other two continuous; the abdomen was not washed out; a cigarette drain was left. The patient made an excellent recovery, and when she left the hospital on January 17 of the present year, she had gained 11 pounds in weight.

DR. BENJAMIN T. TILTON said that during the past two years he had seen ten cases of perforated gastric ulcer, mostly in men of middle age with an alcoholic history. Dr. Downes' case was the first he had seen in a female, although according to the literature it was more common in women than in men.

DR. CHARLES H. PECK said he had operated upon seven cases of perforated gastric ulcer in the past three years, two of them in women and five in men. In several of the cases, the patients were between twenty and thirty years old. Six of them were acute. He had done one recently in which the perforation was of long standing, with adhesions of the edges of the ulcer to the anterior abdominal wall in the left upper quadrant of the abdomen.

DR. JOHN F. ERDMAN said he had had thirteen cases of per-

forated gastric ulcer, four or five in women. The rest were men. In a recent case that came under his observation the perforation was in the cardiac end of the stomach, which he considered was a rare occurrence.

DR WOOLSEY said he could recall only one case of perforated gastric ulcer in a male subject, and that was not an acute case, and was complicated by adhesions to the under surface of the liver. He recalled another case of carcinoma in the male, with perforation of the stomach wall. All his other cases had been in females.

#### GUN SHOT WOUND OF THE ABDOMEN INVOLVING THE SPLEEN

DR. GEORGE E. BREWER presented an unmarried woman, twenty-three years old, who was brought to the Roosevelt Hospital in December, 1906, suffering from a gun shot wound of the abdomen. Upon admission, she was apparently in a moderate degree of shock, her face was pale and the pulse weak, but not particularly accelerated, temperature normal. She complained of severe pain in the left upper quadrant of the abdomen, which was increased on deep inspiration. Examination revealed two bullet wounds, one situated anteriorly, between the eighth and ninth ribs, about 3 inches to the left of the median line, the other on the posterior lateral aspect of the chest at about the level of the tenth intercostal space. As she stated that her assailant stood in front of her, it was probable that the anterior wound was the point of entrance of the bullet.

Examination of the chest was negative. Palpation of the abdomen showed marked rigidity over the entire left side, particularly in the hypochondriac region. Upon opening the abdomen, a fairly large quantity of fluid and clotted blood was found in the peritoneal cavity. As the blood seemed to flow from the region of the spleen, that organ was with considerable difficulty drawn into the abdominal wound. The bullet had evidently penetrated just above the hilum, making a deep groove along the inner surface and free edge. It then penetrated the chest wall, and emerged at the posterior opening. An attempt was made to close the wound in the spleen by mattress sutures, but this failed on account of the friability of the tissues.

As the hæmorrhage was readily controlled by gauze pressure,

a large Mikulicz tampon was introduced, and the spleen pushed back into position. A separate opening was made for the gauze drain, so that in its removal it would not drag the spleen out of place and thus reopen the wound. A hasty examination of the stomach and intestines was made, the abdomen was washed out with salt solution and the wound closed.

The patient made an uneventful recovery. The gauze was allowed to remain in place for ten days, when it was removed without difficulty.

#### ABSCESS OF LEFT LOBE OF LIVER.

DR. BREWER presented a man, forty years old, who was admitted to the Roosevelt Hospital in September, 1906, in a state of septic intoxication. His mind was clouded, and he could give very little information as to the character of his early illness. He complained of vague pain in the upper part of the left side of the abdomen and thorax, which was increased on deep respiration. His temperature was 103; pulse, 120; leucocytes, 18,000. On examination, there was moderate tenderness in the epigastric and left hypochondriac regions, with some muscular rigidity, and an increased sense of resistance on deep pressure. No definite mass could be felt. On auscultation there was diminished respiration over the lower left back, with entire absence of fremitus and marked dulness over the lower 3 inches of the pulmonary area.

Exploratory puncture of the chest gave no evidence of pleuritic effusion. The pulse and temperature remained high, and the patient became somnolent and delirious. An exploratory incision was made through the middle of the left rectus muscle. Upon opening the peritoneum, it was found that the left lobe of the liver was much enlarged and œdematous, and partly attached to the parietal peritoneum by fibrous adhesions. An exploring needle introduced to the depth of 5 or 6 cm. withdrew creamy pus. The liver was then stitched to the parietal peritoneum, and the external wound packed with gauze. Forty-eight hours later the liver was incised, and about a pint of creamy pus evacuated. The finger introduced between the incisions revealed the fact that the abscess was of the subphrenic variety.

Although considerable relief followed the draining of this abscess, the temperature never dropped to normal, and as the

tenderness also persisted, it seemed evident that the pocket was imperfectly drained or that some other focus was present. The pus cavity was thereupon washed out, with considerable improvement. The discharge diminished, and the wound surface was apparently healthy. The patient's appetite and color also improved, and he said that he felt better, but still complained of pain in the side.

Shortly after this period of improvement, his temperature rapidly rose, and he developed some cough and severe pain on deep inspiration. Examination of the thorax showed a large area of flatness, with absence of respiration and fremitus. Exploratory puncture was negative. He continued to grow worse, and remained for some days in a profound septic state, which was thought to be due to a complicating pneumonia. Later, he had chills, with definite daily remissions of temperature, and sweating. He was again aspirated, and pus was finally reached at a great depth from the surface. Under general anæsthesia about 3 inches of the ninth rib were resected, the pleura was then opened and the cavity was found to be free from fluid. A needle introduced through the diaphragm, after penetrating a mass of solid tissue, entered a pus cavity and withdrew a quantity of chocolate colored foul smelling pus. The diaphragm was sutured to the parietal pleura, and the external wound was packed with gauze. Two days later an incision was made into the liver substance, opening the abscess cavity, and a large quantity of pus evacuated.

A rapid improvement followed the drainage of the abscess, which was apparently situated in the left lobe of the liver, and which could not be demonstrated to have any connection with the anterior abscess cavity. From that time on, the patient's convalescence seemed to be established, although on two or three occasions a retention of the secretion would give rise to a sudden temperature, but these attacks were always relieved by establishing better drainage. The patient's illness extended over a period of four months, and he eventually made a satisfactory recovery.

#### BLEPHAROPLASTY BY PREGRAFTED FLAP

DR C. L. GIBSON showed a woman whom he had operated on two and a half years ago for an epithelioma of the outer third of the lower eyelid. The operation was done in two stages. A horizontal incision through the skin  $1\frac{1}{2}$  inches long was made,

starting at the outer canthus. This flap was undermined to a depth of an inch, making a pocket into which was introduced a skin graft with its raw surface looking towards the undermined skin. Three weeks later when the flap had shrunk somewhat and was perfectly lined with its skin graft the flap (Dieffenbach) was completed by two parallel vertical incisions. The whole thickness of the outer half of the eyelid was now excised and the flap swung into the defect.

The result was an admirable imitation of the normal eyelid. The skin graft in its new position quickly took on the qualities of mucous membrane and the flap continues to be non-adherent and with a well defined free edge.

There is now, after two and a half years, a little sagging downward of the flap as a whole, a disadvantage inherent to any flap with tension below, but the free eyelid is perfect in looks and function.

This is a new principle in making new eyelids. To get a perfect result, however, it ought to be applied to some other form of flap free of the disadvantages of the Dieffenbach flap.

#### PLASTIC OPERATION FOR CONGENITAL HABITUAL DISLOCATION OF PATELLA.

DR. CHARLES A. ELSBERG presented a boy, fourteen years old, whose right patella had been freely movable from birth. When the leg was flexed to any degree, the patella would become dislocated. As the child grew older, this occurrence became more and more common, and practically incapacitated him. When the limb was in an extended condition, the patella was approximately in its normal position, but as soon as the leg was flexed to 45 degrees or beyond, the patella, after becoming fixed on the external condyle, would suddenly be dislocated outwards and backwards so as to lie in the outer part of the popliteal space.

Dr. Elsberg said that various operations had been described in order to remedy this condition of habitual dislocation of the patella, but none of them had given uniformly good results. The condition was supposed to be one to the absence of the prominence of the external condyle, or to a defect of the muscles or tendons on one side or the other. The method described by Krogus, of Sweden, and which Dr. Elsberg followed in this case was this:

The patella is exposed by a long curved skin incision passing downwards from the middle of the thigh to the upper part of the leg. The skin is dissected up from the deeper parts. From the tissue to the inner side of the patella a long flap is raised extending from the middle of the thigh to the upper part of the tibia. This flap is made at least 2 inches wide remains attached above and below and consists of all the tissues from the fascia down to the synovial membrane of the knee joint. After the flap has been raised it is sewn into a gap in the tissues to the outer side of the patella which is made by incising the tissues to the outer side of the knee cap from above downward. The gap left by raising the flap on the inner side is closed by interrupted sutures. By this means the tissues to the outer side of the patella are lengthened those to the inner side are shortened and the transplanted fascia muscle flap aids in preventing a recurrence of the outward dislocation of the patella.

The result obtained in the patient presented was an excellent one. The operation was done ten months ago. Even when the limb is violently flexed to the full extent the patella remains in its normal relation to the condyles of the femur.

#### THE LESIONS ASSOCIATED WITH GUN SHOT WOUNDS OF THE STOMACH

DR WALTON MARTIN read a paper with the above title for which see page 699.

DR ALEXANDER B JOHNSON said that in his experience gun shot wounds of the stomach uncomplicated by other serious lesions were extremely rare. During a ten years experience at the Roosevelt Hospital he could only recall one case in which the stomach alone was injured and that case was peculiar in that the patient had had an adhesive peritonitis and all that was necessary to do was to open the abdomen and sew up the bullet wound in the stomach. Where the bullet went to in that case the speaker said he did not know.

In addition to that case Dr Johnson said he could recall only four other cases of gun shot wound of the stomach upon which he had operated. In two of these the shot was fired from in front and the other two from the side or from behind. In one of the latter the lung was injured and in the other the pleura and in both the diaphragm was perforated. In one of the cases

shot from in front, both walls of the stomach were perforated, as well as the small and large intestines, and the most alarming feature of the case was the profuse hæmorrhage from the division of a considerable branch of the mesenteric artery. This patient recovered. The other three died. In the other case shot from in front, both walls of the stomach were perforated, together with four or five perforations of the small intestine. In addition to that, the patient had shot himself through the head, and died from the effects of the latter wound.

In the two cases shot from the side or posteriorly, the complications were numerous. In one of them the bullet passed through the left lung and diaphragm, both walls of the stomach, the large and small intestines and the kidney. Upon opening the abdomen, the injured lung immediately collapsed, and the patient was in very bad condition. The wounds in the stomach and intestines were closed, but that in the kidney was overlooked and proved fatal.

In another case where the diaphragm was also perforated, collapse of the lung took place. In addition to the injuries in the thorax, the bullet passed through the spleen, through both walls of the stomach, through the large and small intestines and into the liver, where it was found at autopsy. This patient died four or five days after receiving his injury, the immediate cause of death being a generalized infection from the *bacillus aërogenes capsulatus*.

In all these cases, Dr. Johnson said, the wounds in the stomach were practically a small matter as compared with the complications that were met with. In those cases where the diaphragm was wounded, with resulting collapse of the lung, that in itself was a very serious factor, and the patient's condition at once became very grave not only from the loss of lung power on that side, but also from the probability of infection of the pleura and the production of empyema.

In the treatment of wounds of the diaphragm, the speaker said he had not been able in his cases to reach them with sutures, although he had tried to do so. In the cases he had met with, an osteoplastic operation on the thorax was out of the question, as the condition of the patients was such that a rapid completion of the operation was imperative.

DR. JOSEPH A. BLAKE said that in gun-shot wounds of the

stomach associated with injuries of the diaphragm and thorax, one of the chief points of interest was in connection with the question of whether it was advisable to do a thoracotomy at the time of the primary operation. He recalled one case of gun-shot wound involving the thorax and diaphragm, the stomach, and the left lobe of the liver, where the patient did well as far as the abdominal condition was concerned, but died of pyopneumothorax. This was in accord with the general experience that these patients died as the result of the thoracic complications rather than the abdominal. In one of the cases reported by Dr Martin, where a thoracotomy was done at the time of the primary operation on the stomach, the former was probably largely instrumental in saving the patient's life. Dr Blake said that in one case of shot-wound passing through the humerus two ribs, the diaphragm and the stomach, he first opened the thorax and sewed the diaphragm to the thoracic wall, and then drained the stomach wound through the thoracotomy wound. The patient died within a few hours after the operation.

DR JOHN F ERDMAN, in reply to Dr Blake's query as to the advisability of doing a thoracotomy at the time of the primary operation on the stomach, referred to a paper by Dr John Young Brown of St Louis, which was read before the American Gynecological and Obstetrical Society at Cincinnati in September, 1906, in which he reported a series of cases of stab and gun shot wounds with several recoveries, and in all of these cases he had done a thoracotomy.

DR WOOLSEY referred to a recent case of gun-shot wound of the stomach involving the thorax. The stomach was perforated anteriorly and posteriorly, near the lesser curvature, these openings were closed, and nothing was done to the wound in the thorax. The patient did fairly well for eight days, when the wound accidentally became infected and death occurred two days later.

In another case of gun shot wound of the stomach with a number of perforations of the intestine, which Dr Woolsey said he reported some years ago the perforations were closed, and the patient made a good recovery. In that case none of the abdominal viscera were injured.

DR MARTIN, in closing said that in most of the cases of recovery after operations for injuries of the diaphragm that had



been reported the injuries were due to stab wounds and not to gun-shot wounds. Suture of the stomach wall through the thoracic wound after stab wound injuries had been done a number of times, but not after gun-shot wounds. In one case reported by Zawadzki, he resorted to a primary thoracotomy, reduced the prolapsed omentum, sewed up the wound in the diaphragm, and then sutured the wound in the stomach through an abdominal incision. The patient survived the operation about eighteen hours. In dealing with perforations of the stomach by small bullets, Dr. Martin said he did not think the wounds were entitled to the significance that was formerly attached to them, the gravity of the injury depending on the associated lesions.

# TRANSACTIONS

OF THE

## PHILADELPHIA ACADEMY OF SURGERY.

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*Stated Meeting, February 4, 1907*

The President, DR JOHN B ROBERTS, in the Chair

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### ENDOTHELIOMA OF THE PALATE

DR JOHN H GIBBON presented a man, aged 26 years, who was admitted to the Pennsylvania Hospital on January 4, 1907. He stated that he first noticed a swelling on the left side of the roof of the mouth five years previous. This has gradually increased until there was a large tense apparently fluctuating mass extending over about one half the hard palate and all of the soft palate on the left side. The entire tonsil and left side of the pharyngeal wall was hid by the growth, which extended down nearly to the base of the tongue. It interfered with the patient's eating, and when ether was given him interfered very greatly with his taking the anæsthetic. The mass appeared to be cystic. At one or two points there was a suspicious hard area. Because of the duration of the growth, however, and its apparently cystic character it was not thought to be malignant. The blood vessels over it stood out very clearly. There was no obstruction of the nares and no apparent involvement of the pharynx, as the finger could be passed easily behind the growth. After the patient was anæsthetized the tongue had to be drawn forward and pressed down with a tongue depressor in order that he could breathe. He was placed in the Rose position and an incision made over the prominent part of the growth. A quantity of material immediately escaped from the mass, which seemed to be undoubtedly sarcomatous. Practically all of the growth was shelled out with the finger. The hard palate was rough, as if its periosteum had been destroyed. Neither the hard nor the soft palate were perforated.

by the growth. Bleeding at this time was very profuse but was controlled by gauze packing and digital pressure. The case seemed a perfectly hopeless one and a prompt and rapid recurrence was expected. The pathologist also on inspection of the material-removed thought it was sarcomatous, but on later thorough examination pronounced it to be an endothelioma. This diagnosis has been fully borne out by the subsequent course of the case. The packing was gradually removed, and although a small cavity still exists most of the induration has disappeared and the patient is entirely comfortable.

Dr. Gibbon is not sure that he removed all of the growth, but upon the slightest evidence of a recurrence he is prepared to again operate and freely remove it. He thinks that an endothelioma in this situation is rather rare. The most frequent site of such growth is the parotid gland. Many of the early cases reported of cure by excision of sarcoma of the parotid were undoubtedly cases of endothelioma.

DR. J. T. RUGH said that some years ago a boy of 18, from Delaware, came to the Jefferson Hospital with a growth in the posterior nares of the right side. It appeared to be fibrous and was removed by means of a wire snare, removal being followed by almost fatal hæmorrhage. The growth recurred and was then diagnosed sarcoma. A second operation, however, resulted in complete cure. No pathologic report on the tumor was obtained, but as it did not recur a second time it was regarded as an endothelioma.

DR. JOHN B. ROBERTS described a case of endothelioma of the left nares, which was partially scooped out, and the patient then treated by the X-rays and by the injection of the toxins of erysipelas and prodigiosus. The tumor seemed to be lessened by this treatment. The patient later went to another Philadelphia hospital and was operated upon, it was stated after the principle of Dawbarn, attempts being made to plug the carotid and its branches with paraffin. Dr. Roberts had heard indirectly that the man died later of secondary hæmorrhage.

DR. W. M. L. COPLIN said that a few years ago he had the opportunity of presenting to the Association of American Pathologists a paper on endothelioma in which he collated all the cases that had been carefully studied—approximately 150. The great mass of these tumors involve the serosæ, particularly the meninges

and pleuræ Several observers have found similar tumors in the ovary, and a number of papers contain reports of endothelioma of the parotid, this being the basis of most of the so-called mixed tumors of that gland The paper by Kelly is one of the best English productions on this subject, Borst, in his classic work on tumors, has made an exhaustive study of these tumors They are interesting to the pathologist because of their histogenesis and peculiar position as to malignancy In this respect they bear the same relation to other tumors of the sarcoma group as does the flat celled cancer to the more malignant epithelial neoplasms They extend along the lymph channels usually without the detachment and transportation of cells seen in the more malignant tumors During the routine examination of tumors at the Jefferson laboratories some unusual specimens have been seen Among these are endotheliomata involving the fissural regions of the face It is probable that many tumors regarded as originating in the antrum or other sinuses are really endotheliomata of the fissures of this region A few endotheliomata of the mammary gland have also been observed the diagnosis being confirmed by the subsequent relative benignancy after complete excision Endothelioma of bone is less frequent than it is in other tissues Here the tumor bears a striking resemblance to cancer, especially the flat celled type, but the structure and location indicate the origin from endothelial elements Vorstmann suggested the classification into hemangio- and lymphangio endothelioma, but we find groups of cases not properly classified as either—for example, those originating in serosæ, commonly the pleura or meninges, less frequently the peritoneum The histogenic study of these tumors arising in the ovary, indicate their origin from the endothelial investment of the marginal genetic layers or connective tissue stroma of the organ

#### RESECTION OF ILEOCÆCAL COIL FOR TUBERCULOSIS

DR JOHN H GIBBON presented a negro aged 40 years upon whom he had operated in September, 1905, for tuberculosis of the ileum and mesenteric glands, resecting a portion of the ileum and cæcum Two subsequent intestinal anastomoses were done

The patient was admitted to the Pennsylvania Hospital in September, 1905 He stated that he had lost weight and had suffered from abdominal pain and indigestion for about seven months

The pain complained of was a general pain in the lower half of the abdomen which seemed from the description to be peristaltic. He was watched carefully for two weeks, a test meal being given and the stomach contents carefully examined. He vomited once or twice during this period, but was able to take full diet without much difficulty. His abdomen was always scaphoid and somewhat rigid. On two occasions a distinct movable mass could be felt in the right iliac region. This was thought to be an enlarged mesenteric gland. There was no fever at any time, and no blood or mucus was passed in the bowel movements. Rectal examination showed some tenderness behind the bladder. No tuberculous lesion of the lung could be discovered. After observing the patient for some time it was finally concluded that he must have some tubercular intraperitoneal lesion, and it was thought that an exploratory operation was justifiable.

The abdomen was opened through the right rectus, and the ileum near its distal extremity was at once encountered. It showed two marked constrictions with a dilated portion of bowel between them, containing a large number of small bodies which felt not unlike gall-stones. These proved subsequently to be watermelon seeds. The patient stated afterwards that he had not eaten a watermelon for over a year. Numerous tubercles were found over the constricted portion of the ileum, and there was a mass of large mesenteric glands behind the ileocæcal juncture. Some of these were as large as hickory nuts. Small tubercles were found in other portions of the peritoneal coat of the bowel. There was no evidence of any tuberculous lesion elsewhere, and there was but a small amount of fluid in the cavity. The bowel was excised from a point some distance proximal to the first stricture to a point above the cæcum. This portion of bowel was removed with its mesentery containing a large number of glands. Other individual glands were then removed. Certainly all the diseased bowel, and apparently all of the involved glands were removed. The open ends of the bowel were then inverted and a lateral anastomosis made between the ileum and the ascending colon. Catgut and celluloid thread were used in making the anastomosis. A gauze drain was inserted down to the inverted ends of the bowel, but not to the point of anastomosis. The operation was a very long one, occupying two hours; this was partly due to the

fact that after dividing the ileum and inverting the end it was found that in order to remove all the enlarged glands a higher division of the bowel would be required. The patient made a very satisfactory recovery after his operation, but on the fourth day he had considerable pain and vomited. Chloride of ethyl was administered, the gauze drain was removed, and there was an escape of considerable gas and some liquid faecal matter. There was no other interference with convalescence but the faecal fistula did not close, although the discharge grew much less.

The patient was readmitted to the hospital on January 14, 1906, complaining of painful peristalsis and with the faecal fistula still open, although discharging but a small amount of faecal matter. The peristaltic movement of the bowel could be distinctly observed through the abdominal wall, the bowel becoming greatly distended in the right iliac region near the wound. With the idea of removing whatever caused the obstruction to the small intestine, and of closing the faecal fistula, the abdomen was opened on the outer side of the old scar. The adhesions were very extensive and it was discovered that the fistula opened probably at the point of anastomosis. The proximal portion of the ileum was enormously distended and hypertrophied. This extended up the ileum for probably two or three feet, the colon was quite collapsed. As the intestines were so matted together it was thought wise to make a new anastomosis between the ileum and the transverse colon. This was done without cutting off the ileum at the site of the previous anastomosis. The fistulous opening into the bowel was closed with sutures but a drain introduced down to this point. The new anastomosis was surrounded by omentum and the abdomen closed, excepting at the point of drainage. The patient made a good recovery from this operation but the faecal fistula continued to discharge.

He was operated upon again in March 1906 by Dr Le Conte, and an attempt made to close the fistula. This was not, however, successful, and a few months later the discharge was greater than it had ever been, although there was no longer any painful peristalsis.

The patient was again seen by Dr Gibbon in December, 1906. He had gained 18 pounds and was able to do light work. He was greatly troubled however, with the discharge of faecal matter, and he was again admitted to the hospital. On January 11, 1907,

Dr. Gibbon opened the abdomen through the left rectus, with the idea of dividing the ileum at the point of anastomosis to the transverse colon and anastomosing it with the sigmoid. The abdominal cavity was found in good condition excepting for numerous small tubercles over the bowel and mesentery; there was no fluid and there were no enlarged glands. The last anastomosis was in good condition and apparently working satisfactorily. There was no distention of the bowel. The ileum was divided near the anastomosis, the two ends inverted, and the proximal one anastomosed laterally to the upper portion of the sigmoid. The abdomen was closed without drainage and without any attempt being made to close the fistula on the opposite side.

Since this operation the patient has progressed very satisfactorily. At first there was a free discharge of fæcal matter from the old fistula, but this stopped after a few days. The fistula was Y-shaped, having two external openings, and one of these closed over firmly after the operation, but the other is still discharging a small amount of mucus and pus. The patient's temperature is normal and he is able to move about and is quite comfortable.

The specimen removed at the original operation was exhibited. It is 38 cm. long, 34 cm. of ileum and 4 cm. of cæcum., The mesentery is attached to the intestine and contains a number of enlarged glands. There are two constrictions, one of 5 cm. from the ileocæcal juncture and the other 13 cm. above this one. The bowel between the two constrictions is very much distended and thickened; in this distended portion between the strictures there was found, when the specimen was examined, two or three ounces of watermelon seeds with one grape seed. The peritoneal covering of the bowel and mesentery is studded with small tubercles and numerous hard bodies can be felt in the intestinal wall. The mesentery is very thick and contains a number of large glands, the largest measuring 4 x 3.5 x 2 cm. These glands on section proved to be caseous. The appendix is tightly bound down to the cæcum by adhesions. The lower stricture is 3 cm. in length and the lumen of the bowel at this point .5 cm. The second stricture is 1 cm. in length and the lumen of the bowel 1.5 cm. The pathological diagnosis was tuberculosis of the intestine with chronic ulceration; tuberculosis of the mesenteric glands; and hypertrophy of the muscular wall of the intestine.

Dr Gibbon stated that this case and another in which he had resected the colon from the hepatic flexure to the middle of the sigmoid and made a successful end to end anastomosis for tuberculosis caused him to feel that patients afflicted with tuberculosis of the intestine stood extensive operation well and that there was a chance for even the most apparently hopeless of these cases. The second case referred to was operated upon March 5 1905 and is perfectly well at the present time. In this case an end to end anastomosis was made and a faecal fistula persisted for some weeks but finally closed. It is thought that a lateral anastomosis is better in resections of the large intestine than the end to end

#### HÆMOPHILIC KNEE JOINT OPERATION CONTROL OF HÆMORRHAGE BY USE OF THYROID EXTRACT

DR J T RUGH by invitation reported this case and presented the patient. For description and remarks upon this case see page 666

DR WILLIAM J TAYLOR said Dr Rugh's results in this case confirmed his observations regarding the control of hæmorrhage though he has had no experience with joints. The use of thyroid extract diminishes the coagulation time of the blood though as yet we do not understand its action. In these cases two conditions must be considered first the coagulation time of the blood second the condition of the tissues. Dr Sajous advances the theory that the pituitary body governs the adrenals and that coagulability is kept up by the thyroid stimulating the pituitary. This has a practical value when the coagulation time is lengthened as in some cases of jaundice. In a number of the latter the time is not lengthened hence thyroid extract will in them have no value. Murphy and Gould in a study of fifteen cases of jaundice from all causes—cancer obstruction etc—did not find in one a change in the coagulation time. In one case of obstructive jaundice from malignant disease under the care of Dr Harte the coagulation time was lengthened. Wiel has used for this condition injections of beef soup practically bouillon into the veins with good results. Dr Taylor is confident regarding the value of thyroid extract when the coagulation time is lengthened. In one case its administration for a few days brought the time down from thirteen minutes to two minutes and six seconds. The individual making the test must be taken into account as methods for deter



mining the coagulation time are not well worked out. There are sources of error in Wright's instrument. In another appliance the blood is kept in motion by a current of air. A practical method is to place a drop of blood on a slide and determine by position of the latter when coagulation has occurred. The personal equation is great and all the tests should be made by one man. The subject is one that should be investigated more carefully. Dr. Taylor now uses thyroid extract whenever bleeding is a probability. He has employed it in operations upon the kidney, bone, for the extraction of teeth and in the case of removing glands of the neck from a boy whose grandfather was a terrific bleeder. In the last case the coagulation time was lowered from eight to three minutes in forty-eight hours and the operation site was perfectly dry.

DR. W. M. L. COPLIN said we know something of the basis of thyroid therapy in cases of hæmophilia. Women escape the affection, hence we look for organs in the female which possibly by an internal secretion combat any tendency to this diathesis. For such organotherapy ovarian extract has been suggested and in some cases has been of value. Hyperthyroidism is more common in the female, the relation between the thyroid metabolism and the general economy being more intimate in this sex. This is shown by the changes in the gland during menstruation and gestation; its relation to myxœdema and exophthalmic goitre is well known. If we are correct in the assumption that activity of the thyroid and parathyroid glands enable the female to escape hæmophilia, the basis of employing thyroid extract to counteract the manifestations of the disease becomes plain. Dr. Taylor referred to the exact cause of hæmophilia. Of the two theories, Dr. Coplin's inclination is toward the histogenous, the hæmatogenous not appealing to him as possessing a sound basis. There is no specific relation between coagulation time of the blood and hæmophilia, the relation being the same as in any anæmia. This diminished coagulability was shown at autopsy upon a case of pernicious anæmia in which the blood clotted in a basin some time after it had been removed from the body, yet there is no necessary relation between secondary anæmia and bleeding. Loeb's studies concerning the relation between tissue juices and the blood indicate that in coagulation there is necessary a certain element which is supplied by the tissues. He suggested as the source of this

element the endothelium of the capillaries. Such element is not supplied when metabolism is deficient, and on this basis may be explained the occurrence of periods when hæmophiliacs are not hæmophiliacs—that is, when they do not bleed excessively. Wright's studies on the calcium content of the blood show that the explanation based upon its lowered quantity applies in some cases, in others the calcium is entirely within the normal limits, and therefore this cannot be the cause of the condition.

Dr. Rugh's case is an instance of the cryptogenic or latent type of hæmophilia. These cases are well known there being at least the gastric, intestinal, biliary, arthritic, and renal types possibly there is a meningeal form. In the renal type the kidney may show no microscopic lesion though hæmorrhage had been severe. It is also to be remembered that paranephric hæmorrhage may follow trifling injuries. König, Broca, and also Poillet, have studied particularly the joint manifestations of hæmophilia, Poillet analyzing 252 cases. In about 50 per cent. of cases the knee is involved and in 25 per cent. the elbow. In none of Poillet's cases was the operative result so good as in Dr. Rugh's case. None was diagnosed before operation. The findings in these joints were well described by Dr. Rugh. Chondroid erosion is marked, in some instances this process extending even into the marrow. Spongy articular cartilages are produced in some cases. Lipping of the articular cartilages at their margins is more marked in operative cases and may become so prominent as to lead to fixation of the joint. This is due to chondroplastic proliferation of the marginal genetic layers of the cartilages, hyperplasia of the serosa not being anatomically important in the locking. These joint lesions are not the result of primary changes in the bone. There has been reported an instance of hæmophilia with separation of the epiphysis due to hæmorrhage between the epiphysis and shaft, with resulting formation of a flail joint. Dr. Rugh's case illustrates the muscular wasting which often accompanies the joint lesion. This remains unexplained, as it is not a question of fixation as in tuberculosis. Sometimes even the tendons wither. This wasting suggests in a way the exploded theory of the neurogenous origin of hæmophilia. A practical point regarding these cases is the almost certain recrudescence of the hæmophilic lesion. The age of Dr. Rugh's patient is against this, as the great majority of cases occur in boys of from four to six. A diagnostic

point in hæmophiliac hæmarthrosis is para-articular hæmorrhage. This is sometimes shown as a faint hazy bluing of the sulcus on each side of the patella. At times distinct hæmorrhage is present. This ought to constitute an important diagnostic feature.

#### PLASTIC RECONSTRUCTION OF THE EYE-BROW AND UPPER EYE-LID FROM THE TISSUES OF THE SCALP.

DR. JOHN B. ROBERTS reported this case with presentation of the patent. The child had a large arteriovenous angioma of the forehead and upper eye-lid, which he treated successfully by strangulation, excision, injection of boiling water and other methods. Its removal left the eye-ball exposed and a corneal ulcer developed. A pedunculated flap from the scalp was brought down to make the upper lid. Subsequently this was split horizontally and the hairy part transferred to the superciliary region to make the eye-brow. Later a portion of this soft hair will be shaved to cause it to become coarser, and probably some of the superfluous hair will be removed by the electric needle.

#### EXCISION OF BRANCHIAL FISTULA.

DR. JAMES W. MACINTOSH presented a boy of twelve years. A small opening in the skin at the lower and inner border of the right sternomastoid muscle was noticed when the boy was two weeks old. This had remained open and discharged mucus except for a period of one and one-half years some time between the age of two and five. From the location of the opening and the fact that it was congenital a diagnosis of branchial fistula was made. Through the fistula a solution of quassia could be injected into the mouth, proof that the fistula was complete. A silkworm gut suture was at first inserted and finally a small lachrymal probe was passed. This enabled dissection and removal of the entire tube. The inner end was pulled down and a chromacized catgut ligature applied. Before it was tightened the ligature was carried to the pharyngeal wall by means of two pairs of curved hæmostats and a second knot then made. The stump was then twisted four times and allowed to retract. The lower end of the external wound is not yet healed because of the eczematous condition of the skin caused by the discharge from the fistula.

DR. JOHN H. GIBBON remarked on the difficulty with which these fistulæ are excised. He never before saw one removed so

entirely as was the specimen shown. Only time will tell if the cure is permanent. Surgeons often feel that the fistula has been completely removed and yet it reforms. If a slight amount of the mucous lining be left recurrence will follow.

DR. W. W. KEEN regards the use of quassia as an ingenious plan well worthy of repetition in future cases of such fistulae. He agrees with previous speakers as to the difficulty of excising the fistulous tract in its entirety. Branchial fistulae are rare, the similar condition of the thyroglossal duct being more common. The latter he has almost never succeeded in curing by one operation.

#### INTRALOBULAR ABSCESS OF LUNG

DR. CHARLES F. NASSAU presented a man aged thirty-eight years who was first seen by him with Dr. M. T. Prendergast October 7, 1906. He had then been ill for ten weeks. The patient was dreadfully emaciated, extremely weak, with a rapid pulse in the neighborhood of 120 per minute. He had very little cough and that was of a hard, brassy character. There was constant pain at the base of the right lung. Puncture of the chest made in the mid axillary line in the fifth interspace and in three different directions revealed no fluid of any kind.

October 19, 1906, he was seen again in consultation with Dr. Prendergast and Dr. Alfred Stengel at St. Joseph's Hospital. A preliminary puncture through the fourth interspace gave vent to abundant pus. About 3 inches of the fourth rib was then excised and through the adherent layers of the pleura an intralobular abscess of the upper lobe of the lung was broken into, evacuating somewhat less than a pint of pus. Light general anesthesia by ethyl chloride, the patient almost dying on the table.

Following this operation the wound did very well, the walls of the abscess collapsed rapidly and the temperature fell immediately to normal. The patient was discharged from the hospital on November 13, 1906. The wound at this time was entirely superficial. The patient continued to do well for one week at his home when he had a chill followed by high fever, sweating and general prostration. On November 23, 1906, after a second consultation with Dr. Prendergast and Dr. Stengel, it was determined that he probably had an empyema below the site of the previous incision into the lung, so a second operation was done con-

sisting in still further excision of the rib previously operated upon, together with a wide excision of the rib below. About two pints of bad smelling bloody fluid, with here and there streaks of pus, was evacuated. In addition to the above the site of the primary operation, two encysted abscesses were encountered and evacuated. The patient's condition was so desperate that in order to give some support to the violent and wide excursions of the partially collapsed lung, a large quantity, about 7 square yards, of gauze was rapidly packed through the wound on the side of the chest. The patient's pulse at this stage was scarcely perceptible, his pupils were widely dilated, lips were purple, respirations could not be counted, his hands, feet and nose were cold. However, sufficient hypodermatic injections of camphorated oil began to bring about reaction. At the end of twenty-four hours one could say that they hoped he would recover.

From this time on convalescence was uninterrupted, although after the removal of the gauze packing introduced at the time of operation one could almost thrust one's whole hand into the patient's pleural cavity. Now the wound has entirely healed except a small granulating area in the skin, hardly an inch in length and less than a quarter of an inch in width. The lung has descended almost to its normal level and the breath sounds on the right side of the chest are quite normal.

#### RUPTURE OF KIDNEY AND LIVER.

DR. CHARLES F. NASSAU reported the following case: A man was admitted to the Frankford Hospital, October 27, 1906. with a history of having been kicked in the right side along the lower margin of the ribs by a horse. When first admitted he was in a state of shock, with rapid shallow respiration which was largely due to the fracture of four ribs on the right side. His temperature, which on admission was subnormal, reacted and rose rapidly. His pulse on admission, while rapid, was of good tension. There were no external marks of violence. The abdominal muscles were rigid, particularly on the right side.

The resident within an hour after his admission noted increasing power with a rapidly rising pulse rate and temperature. Respiration also became more shallow and of a slight sighing type. When seen by the reporter, about three hours after the injury, there was distinct dulness in the right flank. He passed

bloody urine, and on account of his increasing weakness since admission an internal hæmorrhage due to injury of the kidney was suspected. He was immediately etherized and prepared for operation on the table.

An incision was made along the right costal margin, beginning at a point about three inches to the right of the median line and ending well out in the right loin. As the peritoneum was approached it seemed to be infiltrated with blood, in fact so disorganized as to hardly require incision. Blood welled up rapidly out of the abdominal cavity and as the intestines upon superficial examination seemed to be uninjured they were packed out of the way and the region of the kidney exposed. The right kidney was found torn practically entirely in half. The whole organ lay free in the abdominal cavity the peritoneal covering over the kidney not being recognizable. The hæmorrhage was furious. As quickly as possible the renal vessels were clamped and the kidney cut away.

After ligation of the renal pedicle blood continued to ooze from the direction of the liver. Investigation discovered a tear in the liver substance on the posterior edge, extending well up towards the vault of the diaphragm. This was firmly packed and the abdominal wound was then closed except for a point of generous gauze drainage. The man was put back to bed apparently very little worse off for the operative procedure.

During the first 24 hours he passed 15 ounces of urine. Day by day the kidney secretion increased, the urine being quite normal, until on the fourth day he passed 36 ounces of urine. On the fourth day his temperature shot up, he developed an annoying cough and examination of the right lung disclosed a wide spread pneumonia. He died in about three days after the development of the lung condition.

This man at no time had any symptoms that would lead one to suspect a peritonitis. His bowels moved naturally and post-mortem the peritoneal cavity was found well sealed off and appeared to be quite free from any evidence of inflammation.

#### STAB WOUNDS OF THE HEART

DR. RICHARD H. HARTE read a paper with the above title for which see page 672.

DR. JOHN H. GIBBON said the fact that Dr. Harte's patient

lived twenty-three days is an instance of what can be done in wounds of the auricle. Heretofore it has been thought by many that a wound of the auricle was necessarily fatal. This case is only another to show that a patient may recover from a stab wound of the auricle. Infection occurred here and proved fatal, as happens in many cases of heart wound.

DR. JOHN B. ROBERTS mentioned a case, which he previously had reported to the College of Physicians, of a suicidal wound of the heart, in which that organ was not perforated. He had not sutured the wound, but had been able to examine with his fingers the exposed heart. The patient died in twelve or fourteen days from infection, there being pleurisy on the left side and pneumonia of the opposite lung.

SEVERE BURN ON TOP OF HEAD AT SEVEN MONTHS OF  
AGE FOLLOWED BY NECROSIS OF ENTIRE  
OSSEOUS CAP OF CRANIUM.

DR. KEEN read a paper with the above title, for which see page 641.

## REVIEWS OF BOOKS.

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**TUMORS OF THE CEREBRUM** By CHARLES K MILLS, CHARLES H FRAZIER and others Octavo, 1906 Philadelphia Edward Pennock

This little book is composed of a number of reprints—seven in all—of articles written by Drs Mills, Frazier, Spiller, de Schweinitz and Weisenburg, all of Philadelphia. In the first, Dr Mills discusses the focal diagnosis of operable tumors of the cerebrum and discusses with painstaking care the groups of symptoms upon which the localization of tumors of the cerebrum depends. The critical reader cannot help the conclusion, however, that in a large proportion of these cases a very considerable uncertainty must always attend their focal diagnosis. In the second Dr Frazier discusses the surgical aspects of operable tumors of the cerebrum, the paper having been prepared as a sequel to the preceding paper of Dr Mills. The author is in the habit of making an osteoplastic cranial flap of from  $3\frac{1}{2}$  to 4 inches in width, small openings are first made at suitable points with a burr or chisel, and the intervening line of bone is divided—preferably by Cryer's spiral osteotome. The author describes with sufficient fullness various other models of craniotomes, but prefers the instrument of Cryer because, as he says "with it but one preliminary opening in the skull is required, and that a small one, and thence a flap can be fashioned of any dimensions with straight or curved margins as the occasion demands, and that the cutting of the flap is accomplished more quickly than by any other method." In the third paper, which is by Drs Spiller and Frazier, 14 cases of tumor of the brain are studied which were subjected to palliative operation by removal of a portion of the overlying skull cap, to this procedure, the term "cerebral decompression" is given by the authors. Dr de Schweinitz discusses the ocular symptoms of tumor of the cerebrum. Dr Weisenburg, conjugate deviation of the eyes and head, and disorders of associated ocular movements. Dr Mills, in another paper, returns to the subject of the focal diagnosis of cerebral tumors with relation to the significance of Jacksonian epilepsy in their study, and in the final paper, Drs



Mills and Frazier discuss the motor area of the human cerebrum and the surgery of its area. The entire assemblage of papers makes a monograph of great value to both the neurologist and the practical surgeon who may desire to deal with tumors of the cerebrum.

LEWIS S. PILCHER.

DISEASES OF THE NERVOUS SYSTEM RESULTING FROM ACCIDENT AND INJURY. By PEARCE BAILEY, A.M., M.D., Clinical Lecturer in Neurology, Columbia University, New York City; Consulting Neurologist to the Roosevelt, St. Luke's and Manhattan State Hospitals, etc. New York and London: D. Appleton and Company.

With the enormous increase in industrial activity made necessary by mechanical means of productivity, a stupendous increase in the amount of human injury has taken place. While physical violence has been a constant cause for injury from time immemorial it has only been within the past twenty-five years that the effects of traumata on the nervous system have been made the subjects of a more complete and comprehensive analysis. Dr. Bailey's work represents the latest systematic treatise devoted to this general subject.

In a previous work by the same author the so-called "traumatic neuroses" received an almost exclusive attention, but in the present work of 627 pages we have presented a treatise on all the traumatic affections of the nervous system viewed from the standpoint of the neurologist, and dealing with clinical, diagnostic, and therapeutic data.

In a short introduction the general features of the relations of trauma to the nervous system are clearly considered, traumatic in the sense used meaning for the author "quickly acting physical violence or psychic shock which arises outside the body." We also find here a short discussion of what is to be considered functional and what organic, in which the author shows the tendencies of modern biological teachings. In this introduction are also included the general methods of examination of the patient with reference to accident, predisposing features of nervous disease, and some remarks on the examination of the actual injury.

The main body of the book is treated in three parts. Part I deals with the Organic Effects of Injury to the Nervous System; Part II with Functional Effects of Injury; and Part III with

**Medico-Legal Considerations** In Part I, four chapters are devoted to injuries to the brain, their complications, and their physical and mental results, three chapters to injuries to the spinal cord, one to the peripheral nerves, and one to trauma as a factor in the causation of certain degeneration diseases. The medical and legal importance of these chapters can hardly be overestimated. The author is singularly concise and straightforward in his account, and little of importance is omitted. A particularly valuable discussion is the one on prognosis following fracture of the skull, especially of the bones at the base. In at least one-half the cases a fatal result is to be looked for, the majority of deaths being due to the direct results of the injury. 95 per cent of the patients who die from fracture of the base do so within five days of the receipt of the injury. Those who die later die of pneumonia or more rarely of meningitis. Patients who do not die usually recover with reasonable promptness. Bailey calls attention to certain grave symptoms in the prognosis, namely, profound and persistent coma, active delirium, high fever, rapid pulse and respiration which usually foreshadow a fatal outcome. Polyplegia is regularly fatal. High mortality is further to be expected with persistently and equally contracted pupils, with immobile pupils, and with pupils presenting alternating contraction and dilation.

The discussion of the after-results of head injuries offers many medico-legal suggestions. Traumatic cerebrasthenia is for the author a comprehensive term to include these affections, such as dizziness and headache together with changes in the mental makeup, which, while not meriting the term insanity, renders the patient different and less capable. The chief symptoms are headache, dizziness, irritability, ease of fatigue, change in character, and intolerance of alcohol. These cerebrasthenias have a general tendency to recover, but if not, and a mental predisposition exists, a definite psychosis may develop. As to the development of insanity, Bailey quotes Meyer's statement that in about one-half of 1 per cent trauma can be said to bear any definite relation to the insanity. Werner's statistics show a relation of one-third of 1 per cent. Fracture at the base of the skull Bailey believes is a negligible feature in the development of a traumatic psychosis.

The author takes a fairly definite stand against the probability of the causal relation of trauma and a number of the so-called

chronic degenerative diseases, although stating that a dogmatic denial of such a nexus is not possible. For general paresis he takes the ground that the causal relationship is extremely unusual and difficult of proof; for tabes he says there is not satisfactory proof that it has ever been the sole result of trauma. A possible relationship, however, cannot be denied: In progressive muscular atrophy the evidence seems to show the probability,—in paralysis agitans and multiple sclerosis its possibility. It may be seen that the author takes a very conservative, and we believe, a very logical ground. Were he to insist on histo-pathological evidence to show the relationship of trauma to many of these chronic affections, his position would be probably even more dogmatic. As it is, it leaves the subject still open, pending further study.

The second part of the book deals with the functional side of the problem, in which the author discusses the traumatic neuroses of old, introducing, however, a wider and more rational view of the processes which in times past were marshalled under that head. A traumatic neurosis *per se* does not exist, and Bailey prefers to group them as traumatic neurasthenia, traumatic hysteria and unclassified forms. He first considers traumatic neurasthenia, drawing an excellent picture of this condition. Of the prognosis, his views are moderate and to the point. Most of the traumatic neurasthenias get well, but under the stress of litigation their condition, while not aggravated as badly perhaps as those suffering from traumatic hysteria, is not helped. The provisions laid down for treatment are excellent. The chapter on traumatic hysteria is especially full and instructive. It is a thoroughly modern, common sense presentation.

Final chapters on medico-legal relations, malingering, substitution, etc., and a bibliography close this standard treatise, the only one of its kind which is so eminently judicial and praiseworthy for its technical accuracy. SMITH ELY JELLIFFE.

OPERATIVE GYNECOLOGY. By HOWARD A. KELLY, A.B., M.D., LL.D., F.R.C.S. Second Edition. Revised and Enlarged. In two volumes. New York and London: D. Appleton and Company.

The first edition of this excellent and well-known work was issued from the press nine years ago. The second edition, which is now before us, has been rewritten by Dr. Kelly for the purpose

of presenting the important advances which have occurred in the interval in this field of surgical work. Although the two volumes have been subjected to a complete revision, the most notable change and advance is seen in the chapters dealing with the Urethra, Bladder, Ureters, and Kidneys—a field in which the author has done an immense amount of original work and in which he has spared neither time nor energy to bring the results of his labor before us in a most pleasing and instructive manner.

The same general arrangement has been followed as in the previous edition, the work being divided in two volumes each of which contains almost seven hundred pages.

Several new chapters have been added to the work both by the author and by his co-laborators, notable among which is a new chapter on Abdominal Extirpation of the Cancerous Uterus, with 56 new illustrations by Dr John A. Sampson. There are also excellent newly written chapters on the Use of the X-ray in Diagnosis by Dr F. H. Baetjer, one on Bacteriology, by Dr W. W. Ford, and in volume II a new chapter has been added by Dr Elizabeth Hurdon on Gynecological Diseases in Children.

The two volumes contain eleven plates and over 700 original illustrations, most of which have been executed by Max Brodel, Associate Professor of Art Applied to Medicine in the Johns Hopkins University.

Both from a literary and an artistic standpoint Dr Kelly's second edition of *Operative Gynecology* will continue to occupy its place as a standard work of the very highest type. Foremost in originality, replete with interest and sound instruction, this work brought thoroughly up to date will continue to command admiration from those who read and study its pages.

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THE OPERATING ROOM AND THE PATIENT. BY RUSSELL S. FOWLER, M.D., Surgeon to the German Hospital, Brooklyn, N. Y. Octavo, 172 pages, fully illustrated. Philadelphia and London: W. B. Saunders Company, 1906.

Dr Russell Fowler's book is devoted to a consideration of the personnel and arrangement of the operating room, the instrument and supply room, anæsthesia, the preparation and examination of the patient, and the general considerations in the after-treatment of patients who have been operated upon. The book

is primarily for the instruction and guidance of those who are to assist a surgeon in the surgical care of a patient. Although the book in itself expresses chiefly the opinion of one man as to the requirements of such assistance, still it has been developed from an experience in a great many hospitals, and is, to a certain extent, an expression of the methods used in some of the best hospitals in Brooklyn. If this book should be owned, read and carefully followed by every house surgeon in his care and preparation of patients before and after operation, there would be fewer calamities. As a book for nurses engaged in operating-room work, it will serve as a valuable guide. A very valuable addition to the work is the list of instruments and dressing materials commonly employed in most surgical procedures; this list covers very completely the ordinary operations of surgery. The work has been carefully prepared and is very practical.

PAUL PILCHER.

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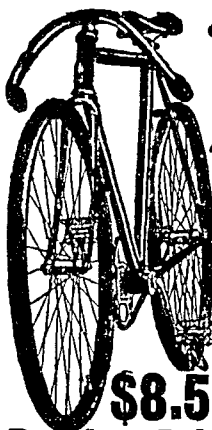
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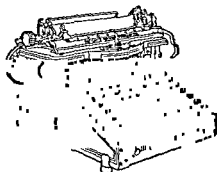
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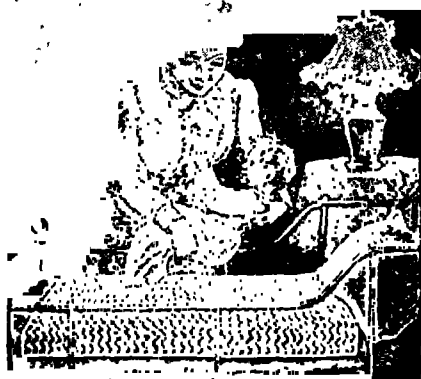
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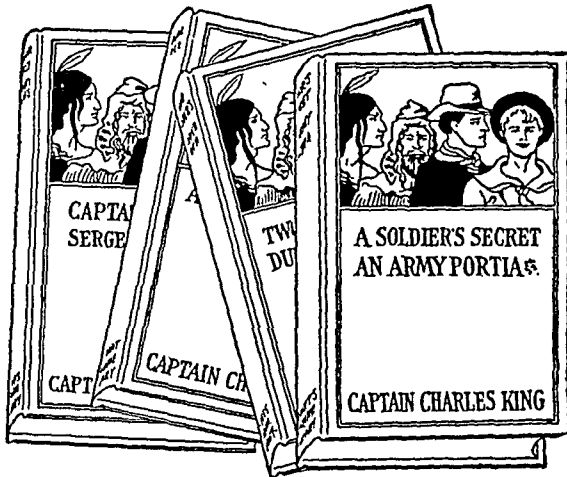
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